



Situational Crime Prevention in the International Supply Chain

The Cost of Alternative Measures

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LIST OF ABBREVIATIONS

ACC3 :	Air Cargo/Mail Carrier operating into the EU from a 3rd Country Airport
AEO :	Authorized Economic Operator
AMR :	Advanced Manifest Rule
CCA :	Crime-Centered Analysis
CCTV :	Closed Circuit Television
CEA :	Crime-Environment Analysis
CSI :	Container Security Initiative
C-TPAT :	Customs-Trade Partnership Against Terrorism
DG TREN :	Directorate-General Transport and Energy
EC :	European Commission
ECAC :	European Civil Aviation Conference
EU :	European Union
FSR :	Freight Security Requirements
GPS :	Global Positioning System
HVP :	High Value Protection
ICAO :	International Civil Aviation Organization
ID :	Identity
IED :	Improvised Explosive Device
ISO :	International Organization for Standardization
ISPS :	International Ship and Port Facility Security (Code)
NCPI :	National Crime Prevention Institute
NL :	(The) Netherlands
PAX :	Passenger Aircraft
PIN :	Personal Identification Number

POP :	Problem-Oriented Policing
RA :	Regulated Agent
SARA :	Scanning – Analysis – Response – Assessment
SOLAS :	Safety of Life at Sea
TAPA :	Transported Asset Protection Association
TIP :	Threat Image Projection
TSR :	Trucking Security Requirements
UK :	United Kingdom
ULD :	Unit Load Device
US :	United States (of America)
VOG :	‘Verklaring omtrent Gedrag’

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INTRODUCTION

This doctoral dissertation is about situational crime prevention in the international supply chain. This area of research has been selected based upon the observation that, especially since 9/11, operators in the industry have increasingly been confronted with programs to secure (international) supply chains against acts of unlawful interference. Some of these programs are mandatory, other are industry driven. The majority of them are quite prescriptive and detailed, and most of them contain the requirement to implement a range of very specific situational measures. When implementing these measures, end-users state to face a number of (unexpected) costs and implementation problems, which may impact the overall success of the initiative. The latter observation led us to look into this subject in more detail, and finally make it a topic for a doctoral research.

This introduction consequently covers the problem setting as described above, the central hypothesis and research questions that have been set forth at the start of the process, the methodology applied to answers these questions, and the structure of the manuscript. Regarding the latter it needs mentioning that this doctoral dissertation is a consolidation of three research papers that have individually been submitted for publication to three different international peer reviewed journals. These papers form the main body of the text, and have been inserted without any changes to their structure or content. Each paper is preceded by a brief introduction covering the bibliographical details and main arguments. The first two papers have already been published (respectively in 2009 and in 2011), and the third paper has been accepted for publication in the European Journal on Criminal Policy and Research.

1. Problem setting

1.1. Government and industry initiatives to secure international supply chains¹

In response to the disastrous events of 11 September 2001², federal and state governments globally have introduced and strengthened a range of programs designed to protect the

¹ This section mainly focuses on programs that have been established in Europe, as these have been analysed as part of the research.

public in general, and the supply chain in particular, against acts of unlawful interference. With the Aviation and Transportation Security Act³, the Customs Trade Partnership against Terrorism⁴ and the Container Security Initiative⁵, the US Government set the scene for the introduction of a range of trans-border security initiatives. The European Union was soon to follow with the enforcement of a series of requirements covering all modes of transport. In order to combat terrorism, the European Union Heads of State called for ‘the strengthening of all forms of transport systems, including the enhancement of the legal framework and the improvement of preventive mechanisms’.⁶ A full implementation of measures to combat terrorism was declared to be ‘a matter of urgency’.

In December 2002 the International Ship and Port Facility Security (ISPS) Code was adopted as an amendment to the SOLAS Convention, describing minimum requirements for security of ships and ports. In 2004 this code was incorporated into European legislation.⁷ As the ISPS rules only cover the direct interface between the vessels and the landside, an additional Directive allowing for tailor-made processes in European ports was put into place.⁸

In the area of civil aviation and air cargo security, Regulation (EC) No 2320/2002⁹ enabled for a European framework with intense levels of security in the form of rules and measures with detailed, legally binding specifications and checks. The European Air Cargo Security Program has been in effect since 19 January 2003, and has been revised several times in order to seek further simplification, harmonisation and clarification of the

² On September 11, 2001, two hijacked airliners destroyed the twin towers of New York’s World Trade Center. Another one slammed into the Pentagon in Washington, and a fourth airliner, believed destined for the White House, crashed in Pennsylvania (Sweet, 2004: 12).

³ Public Law 107-071 passed by the 107th Congress on November 19, 2001.

⁴ The Customs Trade Partnership against Terrorism (C-TPAT) is a voluntary government-business initiative to build cooperative relationships that strengthen and improve overall international supply chain and U.S. border security. More info: www.cbp.gov.

⁵ The Container Security Initiative (CSI) was launched in 2002 by the U.S. Bureau of Customs and Border Protection in order to increase security for container cargo shipped to the United States.

⁶ Council of the European Union, *Declaration on combating terrorism*, Brussels, 25 March 2004.

⁷ *Regulation (EC) No 725/2004 of the European Parliament and of the Council of 31 March 2004 on enhancing ship and port facility security*, Official Journal of the European Union, L 129/6, 29 April 2004.

⁸ *Directive 2005/65/EC of the European Parliament and of the Council of 26 October 2005 on enhancing port security*, Official Journal of the European Union, L 310/28, 25 November 2005.

⁹ *Regulation (EC) No 2320/2002 of the European Parliament and of the Council of 16 December 2002 establishing common rules in the field of civil aviation security*, Official Journal of the European Communities, L 355/1, 30 December 2002.

existing rules, as well as improvement of the various levels of security.¹⁰ It is based on standards contained in ICAO¹¹ Annex 17, recommendations of the European Civil Aviation Conference (ECAC)¹², and Commission proposals. The initial and revised Regulations state that all mail, cargo, courier and express parcels intended to be carried on passenger or all-cargo aircraft, need to be subjected to security controls before being placed on board the aircraft. When the mail, cargo, courier and express parcels originate from a known or account consignor, and sterility of the shipments is maintained until the departure of the aircraft, these security controls need not be applied. The option to secure supply chains as provided for in the EU Air Cargo Security Program requires the consequent provision of a range of different statuses, such as the status of ‘known consignor’ (for passenger aircraft), ‘account consignor’ (for all-cargo aircraft), ‘road haulier’ (for transport companies moving known cargo), ‘regulated agent’ and ‘ACC3’ (for air carriers bringing cargo and/or mail into the European Union from third countries).¹³ All of them have to adopt very specific and binding requirements and implement a range of preventive measures and controls in order to be able to guarantee a free flow of goods and services.

In an endeavour to regulate security in other forms of transport systems (i.e. rail and road transport, inland waterways and short sea shipping), and in order to complement existing Community transport security policies, the Commission issued a Communication and a Proposal for a Regulation on Enhancing Supply Chain Security.¹⁴ This proposal has never been formalized into European legislation, in part because a similar initiative had been developed and enforced by the Customs Directorate of the European Commission. A set

¹⁰ *Regulation (EC) No 300/2008 of the European Parliament and of the Council of 11 March 2008 on common rules in the field of civil aviation security and repealing Regulation (EC) No 2320/2002*, Official Journal of the European Union, L 97/72, 9 April 2008.

¹¹ International Civil Aviation Organization. More info: www.icao.int.

¹² European Civil Aviation Conference. More info: www.ecac-ceac.org.

¹³ *Commission Implementing Regulation (EU) No 859/2011 of 25 August 2011 on amending Regulation (EU) No 185/2010 laying down detailed measures for the implementation of the common basic standards on aviation security in respect of air cargo and mail*, Official Journal of the European Union, L 220/9, 26 August 2011.

¹⁴ Commission of the European Communities (2006) *Communication and Proposal for a Regulation of the European Parliament and of the Council on enhancing supply chain security*, COM (2006), 79, www.ec.europa.eu/dgs/energy_transport/security/intermodal/doc/com_2006_0079_en.pdf, (accessed 29 December 2008).

of security amendments to the Community Customs Code was published in May 2005¹⁵, covering a number of measures to tighten security around goods crossing international borders, the requirement for traders to provide customs authorities with information on goods prior to import to or export from the European Union, the provision to introduce the Authorised Economic Operator (AEO) concept, and the introduction of a mechanism for setting uniform Community risk-selection criteria for controls.¹⁶

Over the past decade, most of these programs have been strengthened following further incidents and changing threat patterns that provoked government and industry intervention. To give just one example, recent (2010) interceptions of improvised explosive devices originating from Yemen, have triggered US and EU governments to further enhance air cargo security regulations and introduce additional safeguards to protect civil aviation. Following these incidents, the Presidency of the European Council and the European Commission set up an ad hoc high level working group to look at ways to strengthen air cargo security.¹⁷ This has led to, amongst other, revised legislation with regards to cargo and mail being carried into the European Union from third countries¹⁸, and discussions on whether or not (and if so, how) to make use of the Customs' system of advance information analysis on all cargo movements entering, transiting and exiting the European Union, as provided for in EC Regulation 648/2005.

The total of supply chain security measures introduced in government programs is further complemented by a range of measures that form part of international standards (e.g. the ISO 28000-series)¹⁹, and various industry-driven security initiatives in which TAPA has taken the lead. TAPA²⁰ – the Transported Asset Protection Association (formerly known as the 'Technology Asset Protection Association') – started off in the United States in

¹⁵ *Regulation (EC) No 648/2005 of the European Parliament and of the Council of 13 April 2005 amending Council Regulation (EEC) No 2913/92 establishing the Community Customs Code*, Official Journal of the European Union, L 117, 4 May 2005.

¹⁶ Taxation and Customs Union (n.d.) *Customs related security initiatives of the EU*, www.ec.europa.eu/taxation_customs/customs/policy_issues/customs_security/security_initiatives/index_en.htm, (accessed 29 December 2008).

¹⁷ Council of the European Union (2010) *High Level Working Group Report on Strengthening Air Cargo Security*, 16271/10, 30 November 2010.

¹⁸ *Commission Implementing Regulation (EU) No 859/2011 of 25 August 2011 on amending Regulation (EU) No 185/2010 laying down detailed measures for the implementation of the common basic standards on aviation security in respect of air cargo and mail*, Official Journal of the European Union, L 220/9, 26 August 2011.

¹⁹ For more info: www.iso.org.

²⁰ For more info see www.tapaemea.com.

1997 and unites global manufacturers, freight carriers, law enforcement agencies and other stakeholders with the common aim of reducing losses from international supply chains. The aim of the association is to provide a forum for responsible managers and to share professional information for mutual benefit. One of TAPA's key activities has been the development and introduction of its Freight Security Requirements (FSR). These requirements have been established by security professionals within the high-tech / high-value industry and specify the minimum acceptable security standards for assets travelling throughout the supply chain and the methods to be used in maintaining those standards. Suppliers can obtain TAPA certification if they meet or exceed the defined criteria. According to the level of certification, 'A' being the highest level and 'C' the lowest, certification is based on external / independent ('A' and 'B' class) or internal auditing ('C' class). The audit bodies are contracted (commercial) entities that are in no way linked to government. Over the years the TAPA FSR have become a widely recognized security standard for the care and handling of freight, as have the TAPA TSR ('Trucking Security Requirements'). The latter was initially designed to be a compliance program²¹ carried out by a self-assessment, but has very recently developed into a proper certification program in its own right, meaning that an independent validator (i.e. a commercial entity) will need to review compliance with the specific requirements before certification is granted.²²

1.2. Supply chain security and situational crime prevention

Between 2006 and 2009 – as part of an FP6 Security Research Project further referred to as the 'Counteract Project'²³ - a series of targeted studies was conducted on behalf of the Directorate-General Transport and Energy of the European Commission (DG TREN), one of them focusing on the effectiveness and potential spill-over effects of counter-terrorism measures in international supply chain security programs.²⁴ As part of this targeted study, two of the programs highlighted in the previous section were selected in order to examine the effectiveness, efficiency and acceptability of supply chain security measures: the EU

²¹ The TSR outlines the processes and specifications for Suppliers to attain TAPA compliance to the TSR on their transport operations. It identifies three compliance levels, level 1 being the most encompassing.

²² Vigilant, TAPA EMEA monthly newsletter, November/December 2011 : 4.

²³ COUNTERACT - Cluster of User Networks in Transport and Energy Relating to Anti-terrorist Activities, 2006–2009.

²⁴ Haelterman, H. (2009) 'Effectiveness and Potential Spill-over Effects of Counterterrorism Measures defined in International Supply Chain Security Programs', Counteract Report FT4/A, EC Contract Number SSP4/2005/TREN/05/FP6/S07.48891, not published.

Air Cargo Security Program, designed to protect European civil aviation against acts of unlawful (terrorist) interference; and the TAPA (2007) Freight Security Requirements, a certification program that was specifically designed for theft prevention. In order to identify and classify the preventive measures contained in these programs, both were analysed to the level of each constituent part (see Annex 1 for more detail). From this exercise it became clear that all measures listed in the selected programs could be classified using the 25-category classification of opportunity-reducing techniques provided for by Clarke and his colleagues (Clarke and Eck, 2003; Cornish and Clarke, 2003; cited in Clarke, 2005: 46-47).

Most criminological theories have traditionally been concerned with explaining why certain individuals are more likely to engage in criminal behaviour compared to others. They refer to particular biological, biochemical or psychological dispositions or influences; inherited traits; a range of social factors or conditions such as poor education, poverty, inadequate socialization, weak bonds to society, weak morals; etc. (Clarke, 1997; Maguire, Morgan and Reiner, 2002; Williams, 2004; Burke, 2005; Newburn, 2007; Wortley and Mazerolle, 2008; Hagan, 2008). Likewise, much crime prevention effort has gone into trying to lessen these dispositions or influences (Tilley, 2005).

Contrary to these more traditional criminological approaches, situational crime prevention is an approach to crime prevention that focuses not upon changing offenders, but on modifying the settings (with its situational factors) in which crime occurs (Clarke, 1997: 2). The concept of situational crime prevention was first introduced in the late 1970's by a team of scholars working in the UK Home Office (Clarke, 1992: vii)²⁵. Studies on institutional treatments for delinquents undertaken by the Home Office Research Unit provided a stimulus for the founding of its theoretical base, together with two independent but related strands of policy research in the United States: Oscar Newman's concept of 'defensible space' (1972), and Jeffery's concept of 'crime prevention through environmental design' (1971; Crowe, 2000; Cozens, 2008) (Clarke, 1992: 5-7). The theoretical development of situational crime prevention was further strengthened by the development of routine activity and rational choice theory (Clarke, 1992: 5-7; Newman,

²⁵ As indicated by Mayhew and Hough (2012: 19), Clarke lays no claim to inventing the term 'situational crime prevention'. According to the authors, the term originated in discussions in the late 1970s in a working group set up by the Home Office Crime Policy Planning Unit.

Clarke and Shoham, 1997). According to rational choice theory, offenders make rational decisions when carrying out a criminal act: if the costs of exploiting a criminal opportunity are perceived as being too high, or if an opportunity is reduced or removed altogether, the offender will cease the activity or look for another and better opportunity (Hamilton-Smith, 2002: 15). Routine activity theory argues that offenders are but one element in a crime, and perhaps not even the most important element. The routine activity approach emphasizes how illegal activities feed on routine activities: everyday life sometimes delivers temptations without controls (Felson, 1998: 73). According to Cohen and Felson, 'crime occurs when a motivated offender and suitable target (or victim) converge in space and time in the absence of a capable guardian' (Clarke, 1992: 10). Routine activity, rational choice and crime pattern theory – sometimes referred to as 'opportunity theories' (Newman, Clarke and Shoham, 1997: viii; Clarke, 2005: 14; Lilly, Cullen and Ball, 2007: 266) or 'crime theories' – all give an important role to situational factors in crime. Although somewhat different in focus, they provide a solid theoretical base for the concept of situational crime prevention: 'routine activity theory as a "macro" theory that seeks to explain how changes in society expand or contract opportunities for crime; crime pattern theory as a "meso" theory that seeks to explain how offenders seek or stumble across opportunities for crime in the course of their everyday lives; and the rational choice perspective as a "micro-level" theory that deals with the decision-making processes that result in an offender choosing to become involved in crime and selecting specific crimes to commit' (Clarke, 2005: 41).

Ever since its introduction, the concept of situational crime prevention has not been without its share of resistance. Clarke (2005) summarizes the most frequent criticisms as follows:

- The approach is simplistic and a-theoretical, accused of ignoring the vast body of criminological research establishing that the root causes of crime lie in deprivation resulting from genetic inheritance, personality and upbringing, or from social, cultural, racial and economic disparities (see above). To suggest that there is a direct link between opportunity and crime is considered to be an oversimplification of the determinants of human behaviour (see also Newburn, 2007: 566).

- It has not been shown to work, it displaces crime and often makes it worse (see also Tilley, 2005: 6; Newburn, 2007: 296).
- It diverts attention from the root causes of crime by offering quick and superficial ‘fixes’ to crime symptoms (see also Felson and Clarke, 1997: 198).
- It is a conservative, managerial approach to crime; ‘damned’ as administrative criminology because of its origins²⁶; castigated for its lack of social awareness in its choice of crimes to address; accused of paying too much attention to protecting the property and interests of the powerful whilst neglecting crimes against women and minorities; and said to lack any vision and social purpose.
- It promotes a selfish, exclusionary society (see also Sève, 1997: 193; Mayhew and Hough, 2012: 19).
- It blames the victim for not taking (sufficient) precautions against crime.
- It promotes “Big Brother” and restricts personal freedoms (see also Sève, 1997: 192; Felson and Clarke, 1997: 198; von Hirsch et al., 2000; Tilley, 2005: 6; Newburn, 2007: 296).

Although a high level theoretical discussion on the pro’s and contra’s of situational crime prevention compared to more traditional criminological approaches does not form part of the scope of this dissertation²⁷, some of the above criticisms will be referred to in the various chapters of this manuscript. This is e.g. the case for displacement and escalation effects; and for the potential impact of situational measures on civil liberties and personal freedoms.

1.3. Situational crime prevention techniques

The set of situational crime prevention measures or techniques has evolved quite significantly over the past years. The original formulation of situational crime prevention included an eight-category classification of opportunity-reducing techniques of which some had proven to be useful while the remainder required modification (Clarke, 1992:

²⁶ Mid 1980’s, Young witnessed a shift away from mainstream criminology in official (mainly UK Home Office) circles to what he terms ‘administrative criminology’. According to Young, this administrative criminology represents a return to classical thinking which sees crime in voluntaristic (non deterministic) terms (Young, 1986; cited in Jupp, 1989: 21).

²⁷ The subject of this study starts from the observation that most of the supply chain security initiatives primarily comprehend situational measures.

11). In his first edition of ‘Situational Crime Prevention’ (1992), Clarke presents a revised classification of twelve techniques, adding new categories and re-labelling existing ones. These twelve have later (1997) been expanded by Clarke and Homel to sixteen, including a new category of ‘removing excuses for crime’. Finally, in response to Wortley’s (1997; 2001) remarks on controlling situational precipitators, Cornish and Clarke (2003) expanded the techniques further to twenty five by including a category ‘reducing provocations’. As such the classification of preventive techniques has grown in step with the expanded theoretical base of situational prevention (Clarke, 2005: 48; Mayhew and Hough, 2012: 21). Table 1 provides a full overview of situational techniques, listed under five basic strategies: (1) increasing the perceived effort, (2) increasing the perceived risk, (3) reducing the anticipated rewards, (4) removing excuses and (5) reducing provocations.

Table 1: Situational Crime Prevention Techniques (source: Clarke, 2005: 46-47)

Increase the effort	Increase the risk	Reduce the rewards	Reduce provocations	Remove excuses
<i>1. Harden targets</i> (e.g. immobilisers in cars, anti-robbery screens)	<i>6. Extend guardianship</i> (e.g. cocooning, neighbourhood watch)	<i>11. Conceal targets</i> (e.g. gender-neutral phone directories, off-street parking)	<i>16. Reduce frustration and stress</i> (e.g. efficient queuing, soothing lighting)	<i>21. Set rules</i> (e.g. rental agreements, hotel registration)
<i>2. Control access to facilities</i> (e.g. entry phones, alley-gating)	<i>7. Assist natural surveillance</i> (e.g. improved street lighting, neighbourhood watch hotlines)	<i>12. Remove targets</i> (e.g. removable car radios, pre-paid public phone cards)	<i>17. Avoid disputes</i> (e.g. fixed cab fares, reduce crowding in pubs)	<i>22. Post instructions</i> (e.g. ‘no parking’, ‘private property’)
<i>3. Screen exits</i> (e.g. electronic tags for libraries, tickets needed)	<i>8. Reduce anonymity</i> (e.g. taxi driver ID’s, ‘how’s my driving?’ signs)	<i>13. Identify property</i> (e.g. property marking, vehicle licensing)	<i>18. Reduce emotional arousal</i> (e.g. controls on violent porn, prohibit paedophiles working with children)	<i>23. Alert conscience</i> (e.g. roadside speed display signs, ‘shoplifting is stealing’)
<i>4. Deflect offenders</i> (e.g. street closures in red light district, separate toilets for women)	<i>9. Utilise place managers</i> (e.g. train employees to prevent crime, support whistle blowers)	<i>14. Disrupt markets</i> (e.g. checks on pawn brokers, licensed street vendors)	<i>19. Neutralise peer pressure</i> (e.g. ‘idiots drink and drive’, ‘it’s ok to say no’)	<i>24. Assist compliance</i> (e.g. litter bins, public lavatories)

<p>5. <i>Control tools / weapons</i></p> <p>(e.g. toughened beer glasses, photos on credit cards)</p>	<p>10. <i>Strengthen formal surveillance</i></p> <p>(e.g. speed cameras, CCTV in town centres)</p>	<p>15. <i>Deny benefits</i></p> <p>(e.g. ink merchandise tags, graffiti cleaning)</p>	<p>20. <i>Discourage imitation</i></p> <p>(e.g. rapid vandalism repair, V-chips in TV's)</p>	<p>25. <i>Control drugs / alcohol</i></p> <p>(e.g. breathalysers in pubs, alcohol-free event)</p>
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Increasing the (perceived) effort

The first set of techniques is designed to make it more difficult for the offender to commit a particular crime, or in other words: to increase the effort combined with committing a crime as perceived by the offender. This can be achieved by means of:

- *Target hardening*, i.e. obstruct a potential offender by physical barriers through the use of locks, safes, screens, reinforced materials, etc. Examples of target hardening include anti-bandit screens on post office counters, transparent screens to shield bus drivers, strengthened coin boxes in public telephones, steering locks on cars, improved design of ticket machines in the London Underground, the use of immobilisers, on-board safes on buses, the use of damage-resistant materials, etc. (Clarke, 1997: 17; Clarke and Eck, 2003: 6-3; Clarke, 2005: 46; Morgan and Cornish, 2006: 16).
- *Access control*, i.e. introduce measures intended to exclude potential offenders from facilities / potential crime scenes. Examples from literature include the use of electronic personal identification numbers (PIN's), entry phones, electronic access to parking garages, manned reception desks, baggage and passenger screening, etc. (Clarke, 1997: 17; Clarke and Eck, 2003: 6-3).
- *Exit screening* to ensure that those leaving a building, facility or some other place have not stolen anything, have paid all fees and taxes, etc. Examples include the use of electronic (merchandise) tags in shops and libraries, export documents, border controls when leaving a country, parking tickets required to exit station car parks, etc. (Clarke and Eck, 2003: 6-3; Morgan and Cornish, 2006: 16).
- *Deflecting offenders* (i.e. leading offenders away from crime targets). Examples include segregating rival groups of soccer fans in the stadium to reduce fighting, scheduling arrival and departure times and routes of rival groups of fans,

scheduling the last bus to leave immediately after pub closing time, only allow authorized personnel in shipping areas, etc. (Clarke, 1997: 18-19).

- *Controlling tools and weapons* (and other crime facilitators). Some examples: the introduction of 'toughened' beer glasses or plastic mugs to prevent glasses being used as weapons when broken, the introduction of Caller-ID in order to reduce obscene telephone calls, put restrictions on the sale of spray-cans to juveniles, introduce photos on credit cards, etc. (Clarke and Eck, 2003: 6-4).

Increasing the (perceived) risk

The second series of techniques aims at increasing the (perceived) risk of being apprehended and is based on the assumption that offenders worry more about the risks of being apprehended than about the consequences if they are caught (POP Center, 2011).

In order to increase this perceived risk, one can:

- *Extend guardianship* or, in other words, introduce 'capable guardians' such as alarm systems, neighbourhood watch schemes, etc. (Clarke and Eck, 2003: 6-5; POP Center, 2011).
- *Assist natural surveillance*, e.g. by trimming bushes around premises in order to enhance visibility and natural surveillance by people passing by, through enhancing lighting conditions, etc. (Clarke and Eck, 2003: 6-5).
- *Reduce anonymity* (i.e. take measures to reduce anonymity and, as such, enhance social control). A fine example of this technique is to introduce the requirement for staff to wear name tags.
- *Utilise 'place managers'* and try to get maximum profit out of surveillance systems (e.g. CCTV) and out of the surveillance role performed by, e.g., shop assistants, hotel doormen, car park attendants, bus or train conductors, resident caretakers, etc. (Clarke and Eck, 2003: 6-5), as the above employees assume some responsibility for monitoring conduct in these workplaces.
- *Strengthen formal surveillance* provided by police, security guards, store detectives, etc. whose main function is to furnish a deterrent threat to potential offenders. The introduction of police bike controls to curb auto theft (Clarke, 1997: 20) is just one example of this frequently used technique.

Reducing the anticipated rewards

A third set of techniques is designed to reduce the anticipated rewards for the offender, being material rewards or other rewards such as sexual release, intoxication, excitement, revenge, respect from peers and so forth (Clarke and Eck, 2003: 6-6). These techniques include:

- *Concealment of targets*, e.g. hide valuables to prevent burglary, avoid parking desirable vehicle on the street during night time, use unmarked transportation units for transporting high value freight, etc. (Clarke and Eck, 2003: 6-6).
- *Target removal* (e.g. replacing cash money transfers by electronic systems such as credit cards or phone cards, discourage patients to keep cash money or other valuables in their hospital rooms, discourage staff to take valuables to the office, etc.).
- *Identification of property* to make it less easy for resale on the 'black market' and, as such, less desirable for offenders. Examples of this technique include writing ones name in a book after purchase, mark identification numbers on major parts of bikes, cars or motorbikes, etc. (Clarke, 1997: 22).
- *Disruption of markets* for stolen goods (e.g. tell the public how to report shops or individuals that sell or unblock stolen phones).
- *Denial of benefits*, e.g. the installation of road humps to deny the benefits of speeding, the use of ink tags on brand clothing or the application of security codes in car radios (Clarke and Eck, 2003: 6-6).

Reducing provocations

A fourth strategy is aimed at reducing provocations, i.e. situations that precipitate or induce crime. In order to do so, one can either:

- *Reduce frustration and stress* in order not to provoke violent or unwanted behaviour (e.g. avoid having people standing in a queue for hours without any explanation in order to prevent violent or aggressive behaviour).

- *Avoid disputes* that may escalate into criminal or unwanted behaviour, e.g. by setting fixed taxi fares to prevent cheating and disputes or by segregating rival fans in soccer stadiums (POP Center, 2011).
- *Reduce emotional arousal*, e.g. by prohibiting convicted paedophiles from taking jobs involving contact with children (POP Center, 2011).
- *Neutralise peer pressure* (e.g. by introducing good role models).
- *Discourage imitation*, e.g. by installing 'V-chips' allowing parents to program their TV's to prevent children viewing violent programs, by persuading media not to publish details of crime incidents and techniques used, etc. (Clarke and Eck, 2003: 6-8; Morgan and Cornish, 2006: 16).

Removing excuses

A fifth and final set of techniques aims at removing excuses for unwanted behaviour. Often offenders make moral judgments about their behaviour and use excuses to justify their actions. In order to tackle this behaviour one can:

- *Set rules* and formalize what behaviour is acceptable and what is not by introducing new rules or procedures and clarify those already in place.
- *Post instructions* in public in order to prevent people claiming ignorance of the rules or to show precisely where the instructions apply (Clarke and Eck, 2003: 6-10).
- *Alert conscience*, e.g. by putting up signs stating that 'shoplifting is stealing' or 'smoking is illegal, selfish and rude', thus focusing on specific forms of crime occurring in discrete, highly limited settings with the purpose to alert and stimulate feelings of conscience at the point of committing a specific kind of offence (Clarke and Eck, 2003: 6-10).
- *Assist compliance* by putting things in place that aid in following the rules of conduct. Some of the examples provided by Clarke and Eck (2003:6-10) are: building public lavatories to avoid urinating in the streets, subsidising taxi rides home for those who have been drinking too much, and provide litter bins and graffiti boards in public places.

- *Control disinhibitors such as drugs or alcohol* as they undermine inhibitions or impair perception and cognition so that offenders are less aware of breaking the law (White and Humeniuk, 1994, cited in Clarke, 1997: 25).

The first set of techniques (i.e. increasing the perceived effort to commit a crime) is quite common in transportation security and forms part of various supply chain security programs. Some examples taken from the European Air Cargo Security Regulations and the TAPA Freight and Trucking Security Requirements, include: (1) access control to premises and designated areas in order to ensure that air cargo is secured from unauthorized interference; (2) proper packaging and sealing of consignments of air cargo; (3) locking and sealing of vehicles; (4) providing parking areas for private vehicles separate from shipping, loading and cargo areas; (5) protecting warehouse windows or other openings in warehouse walls and roofs; (6) protecting ground floor warehouse windows by anti-ram posts or other physical barriers; (7) providing high value security cages for assets remaining on site; (8) utilizing hard sided instead of soft sided trailers; (9) using padlocks on trailer doors during transport; etc. (Haelterman, 2009a: 15-35). Increasing the perceived risk of being apprehended is also an often applied technique. Some typical examples include: (1) conducting identity checks on persons delivering cargo or entering a site; (2) requesting staff to report any irregularities immediately to management or to the authorities; (3) providing sufficient lighting inside and outside the facility; (4) challenging unidentified persons present on site; (5) installing CCTV to cover the movement of vehicles and individuals; (6) alarming warehouse doors and windows, truck, trailer and cabin doors; (7) conducting random trash inspections in warehousing facilities; etc. (Haelterman, 2009a: 15-35). A typical (relevant) example of reducing the anticipated rewards for the offender, is the replacement of cash money transfers upon delivery of a consignment by electronic systems, avoiding cash money being transported and – as such – making pick-up and delivery vans a less desirable target for potential offenders. Finally, removing excuses by means of rule setting, posting instructions, alerting conscience, etc. also form typical ingredients of most transportation and supply chain security policies and programs, as was illustrated in the Counteract targeted study (Haelterman, 2009a: 15-35). Although Clarke's classification of techniques comprises five different strategies, it is worth observing that the first two strategies (i.e. increasing the

perceived effort and increasing the perceived risk) are dominant in the programs that were analysed as part of this study (Haelterman, 2009a: 36).

1.4. Implementation problems

One of the other key deliverables identified in the Counteract study – apart from the classification of the requirements imposed on operators - was to comment on the effectiveness, efficiency and acceptability of the preventive measures defined in the European Air Cargo Security Program, and in the TAPA (2007) Freight Security Requirements. Relevant data on the measures' (perceived) effectiveness was obtained from 37 regulated agents listed in the Netherlands, from 3 major international express companies and from 7 users of the TAPA Freight Security Requirements. By means of a series of semi-structured questionnaires, respondents were asked to qualify the (perceived) effectiveness of the various measures, and report any implementation problems they had experienced; whether general in nature, or specific to their own situation (Haelterman, 2009a+b). In this regard, the study revealed a series of costs and implementation problems relating to the availability of certain measures that are required by policy makers (e.g. limited abilities to verify information across borders and legal limitations to conduct pre-employment or criminal history checks); to their practicability and impact on core business processes; to the (financial and human) resources required to implement and maintain them; and to their negative impact on the (perceived) freedom of movement and privacy of staff. They further relate to the level of knowledge and expertise required for assessing, evaluating, prioritizing and tackling criminal risks; to the level of (user) belief in their effectiveness; and to the level of awareness and commitment of end-users and other stakeholders (Haelterman, 2009b). Annex 2 provides an overview of the implementation problems reported by end-users of the European Air Cargo Security Program (version 2005 – NL)²⁸, and by users of the TAPA 2007 Freight Security Requirements.

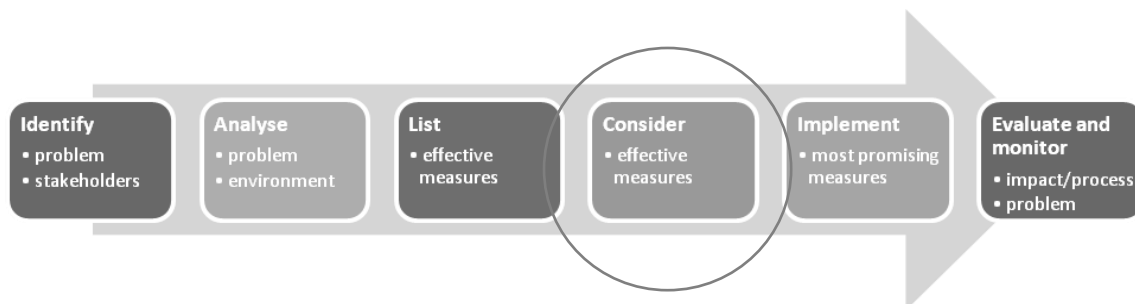
²⁸ The measures contained in the EU Air Cargo Security Program are communicated on a 'need to know' basis only. Currently they are contained in separate Commission Decisions to guarantee confidentiality. As the Program has undergone so many changes over the past years, we considered it no problem to disclose some of the content of the 2005 version in this Annex, especially as it illustrates the various clusters of implementation problems reported on by its end-users.

2. Research questions

Taking into consideration that operators in the international supply chain are increasingly being made responsible for the introduction of preventive controls - as illustrated in section 1.1. - and taking into consideration that previous research revealed that they state to face a range of costs and implementation problems when putting the necessary safeguards in place, raises the concern whether or not they are being offered sufficient guidance; and whether or not policy makers have sufficiently considered the proposed measures prior to making them mandatory for implementation.

This doctoral dissertation aims to provide such guidance, or at least to contribute to a better understanding of what is required to make the introduction of preventive measures into a success. It aims to provide a better insight in the actual cost of situational crime prevention in a business environment, enabling practitioners and policy makers to make informed decisions when deciding on what measures best to implement or enforce. It does not consider the effectiveness of situational measures but merely aims to contribute to the selection process of alternative measures that are deemed effective to tackle a certain (crime) problem (see figure 1).²⁹ It further does not consider the pro's and contra's of situational crime prevention compared to more traditional criminological approaches, as our research starts from the observation that policy makers appear to have put forward the introduction of situational measures as their preferred option.

Figure 1: Focus area of the study



²⁹ The scope of this thesis is limited to one particular stage in the design process, being the consideration of alternative measures that have been selected as effective to tackle the problem or risk, but haven't been implemented yet. As such, this dissertation is by no means a study into the effectiveness of situational measures, nor an evaluation study of supply chain security programs or measures that have already been implemented.

The central hypothesis that was put forward at the start of the study, is that *a thorough and “ex ante” consideration of the various measures that are deemed effective to tackle a certain crime problem or risk, may add value to the overall preventative effort.* The following research questions were identified:

- What implementation problems are reported by end-users in the supply chain?
- How do these relate to what we already know from academic literature on situational crime prevention?
- How can costs and implementation problems best be classified?
- What should fall within the scope of an ex ante consideration of preventive measures?
- When should this consideration ideally take place?
- What can we learn from the above to guide future programming?

3. Research design

In order to provide an answer to these questions, a variety of research methods was applied:

- (1) As to identify and illustrate the implementation problems reported by operators in the supply chain, a preliminary (exploratory) survey was conducted as part of a targeted study on behalf of the European Commission.³⁰ A self-completion questionnaire composed of a number of pre-coded closed questions and one main open-ended question was sent to all Regulated Agents listed on the official site of the Dutch Government³¹, as well as to the four major European Express Integrators (and – under a different scope - to a number of users of the TAPA Freight Security Requirements). The companies were first contacted by phone in order to explain the objectives of the study, and to ask for the contact details of the person responsible for implementing air cargo security measures (which was in most cases the Aviation Security Advisor). A copy of the questionnaire was then sent by e-

³⁰ COUNTERACT - Cluster of User Networks in Transport and Energy Relating to Anti-terrorist Activities, 2006–2009.

³¹ www.kmarcargoregister.nl.

mail for completion.³² A number of actions was taken to maximize the response rate (Bulmer, 2001: 49-51; Simmons, 2001: 97-100; Esterberg, 2002: 45; Bijleveld, 2007: 238) :

- The scope and objectives of the survey were clearly defined in the introductory part of the survey, as well as in a covering letter provided for by the Head of Unit 'Security of surface transports and protection of critical infrastructure' of the European Commission. The latter further highlighted the importance of a high return in the interest of all business players.
- Clear instructions were provided to assist the respondents in completing the questionnaire, avoiding any potential misinterpretation.
- As to guarantee confidentiality and fully respect the doctrine of informed consent, it was clearly stressed that cooperation was purely on a voluntary basis, and that the study results would be analyzed and presented without any reference to the respondent's identity.
- Finally, as to minimize non-response, the questionnaire was kept as concise as possible.

Following a range of questions querying some general background details (e.g. company size, number of employees, number of sites in Europe, etc.), respondents were given an overview of the various measures contained in the program and asked what implementation problems they encountered when implementing them (free text input). They were encouraged to list all possible implementation problems they could think of, whether general in nature or specific to their own situation, and to provide as much detail and examples as possible. They were further asked to return the completed questionnaire within two weeks, after which those that hadn't responded were contacted a second time by phone or e-mail to maximize the response rate.

From the research population (= a total of 261 companies including the four major European Express Integrators)³³, 40 completed and returned the questionnaire,

³² The reason for choosing an electronic survey has been to enable reaching a large population relatively cheaply (Simmons, 2001: 87).

resulting in a response rate of 15,32%.³⁴ As such, relevant data was obtained from 37 regulated agents listed in the Netherlands, from 3 major international express integrators, and from 7 users of the TAPA FSR (Haelterman, 2009a+b).

- (2) As to further analyze and classify the costs and implementation problems reported on by end-users, a thorough literature review was conducted covering the existing body of knowledge on situational crime prevention (Bijleveld, 2007: 79). Based on this analysis, implementation costs have been differentiated from a range of potential reverse effects (i.e. consequential costs resulting from the implementation), and from a series of generic preconditions that relate to the introduction of preventive measures in general. These were then incorporated into a conceptual model designed to identify the scope of an ex ante consideration as part of a generic program design.
- (3) Finally, the application of this conceptual model was illustrated by means of an ex ante consideration of alternative measures to control unauthorized access to pick-up and delivery vans, a typical ingredient of a number of anti-theft and anti-terrorism supply chain security programs. As part of this study, two (focus) group meetings and two surveys were conducted in a local branch of an international express carrier :
 - a. As to identify and define the problem on hand, and as to list a number of risk mitigating measures that were thought of to be effective, an initial focus group meeting was organized with the security representatives of the branch, moderated by the researcher (Cronin, 2001: 165). A focus group methodology was chosen as it enables to explore participants' views and experiences in full depth. As to remain free of researcher influence, a low to medium level form of moderation was obtained for (Cronin, 2001: 166).

³³ End of July 2008, 300 business locations were recorded in the official database of the Dutch Government. Based on the recorded info (i.e. company name), some locations form part of the same legal entity, which brings the total research population for the Regulated Agents back to 257.

³⁴ As indicated by Simmons (2001: 87), the main arguments against using postal questionnaires have generally been that, despite the efforts displayed to maximize cooperation, the response rate in general remains low.

b. As to assess the non-monetary cost of the proposed measures, and as to verify whether the necessary preconditions are in place to make their introduction a success, a survey was conducted amongst the full population of van drivers working for the branch. The first part of the questionnaire contained a range of questions on the background variables of the respondents (i.e. their gender, age, duration and type of employment, and any previous victimization). The second part contained a series of statements on which the respondents were asked to give their personal opinion. Each item was scored on a one to five point Likert scale (Procter, 2001: 111-112). The statements used were carefully worded as to make sure that they had a maximum content validity (i.e. questioning what they were meant to question). Prior to presenting the survey to the drivers, a small-scale pretest was conducted by presenting the questionnaire to a colleague familiar with the context. After having incorporated some minor recommendations that came out of the pretest, the questionnaire was presented to the drivers during a group meeting. During this meeting the drivers were presented some basic information on the aims and scope of the study, as well as some instructions for completing the questionnaire. To motivate them for completing the entire survey, their importance to the overall study was accentuated. It was further stressed that cooperation was on a voluntary basis, and they were given a name of an independent contact person to reach out to in case they wanted additional information on the scope and objectives of the study.³⁵

The drivers were initially given one week to return the completed questionnaire in a blank and closed envelope. After this period of one week, a brief reminder was sent out. The survey was closed after two weeks, and out of a total of 45 drivers, 23 returned a completed questionnaire, resulting in a response rate of 51,11%. The answers provided by the respondents were then inserted in an SPSS data-file. The background variables were listed and compared to the full population. The local Operations Manager, who has a clear view on all his drivers, could

³⁵ The company's official Confidant Advisor (i.e. 'vertrouwenspersoon') was asked to act as the central point of contact for the drivers.

confirm that the spread of these background variables reflects the total spread in the targeted population. This means that the data used for further analyses was not substantially biased by a non-coverage problem (Arber, 2001: 60).³⁶ The individual items on the drivers' opinions were summed up to build a relevant scale. The reliability of these scales was tested by means of Cronbach's alpha, and items were excluded when this brought down the value of alpha (Bijleveld, 2007: 232). The scales were also tested on their one-dimensional character. The scores of the respondents on these scales were then interpreted to form our conclusions.

- c. As to assess the potential for displacement and other reverse effects, a second focus group meeting was organized with the (same) security representatives that participated in the initial session. This research method was chosen due to the limited number of participants and the high level of verbal and cognitive skills of the individuals involved. The participants were informed of the goal of the focus group and then left to interact, with the researcher acting as the moderator. This setup enabled to gather a lot of information in a limited time frame. For each of the proposed measures it was assessed to what type of displacement its introduction might potentially lead, based on past experience and knowledge gained from specialist literature and intelligence sharing within the sector. Following this exercise, the various measures were ranked by each individual participant according to their perceived potential for other reverse effects. This ranking was established by means of a survey.

4. Structure doctoral dissertation

This dissertation is structured around the research questions listed under section 2 (see above). Each chapter is an exact copy of a paper that has been published (or accepted for publication) in an international peer reviewed journal, and is preceded by a brief summary highlighting the main arguments.

³⁶ If non-responders differ in significant ways from responders, the researcher ends up with a biased sample and inferences to the research population will be wrong.

The following research papers have been combined in this manuscript:

- (1) HAELTERMAN, H. (2009) 'Situational Crime Prevention and Supply Chain Security: an 'Ex Ante' Consideration of Preventive Measures', in: *Journal of Applied Security Research*, 4 (4), 483-500.
- (2) HAELTERMAN, H. (2011) 'Re-thinking the Cost of Supply Chain Security', in: *Crime, Law and Social Change*, 56 (4), 389-405.
- (3) HAELTERMAN, H., CALLENS, M. & VANDER BEKEN, T. (2012) 'Controlling Access to Pick-up and Delivery Vans: the Cost of Alternative Measures', accepted for publication in the *European Journal on Criminal Policy and Research*.

In the fourth and final chapter the main arguments put forward in these research papers have been consolidated into a general conclusion.

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CHAPTER 1: SITUATIONAL CRIME PREVENTION AND SUPPLY CHAIN SECURITY. AN 'EX ANTE' CONSIDERATION OF PREVENTIVE MEASURES³⁷

Research paper: HAELTERMAN, H. (2009) 'Situational Crime Prevention and Supply Chain Security: an 'Ex Ante' Consideration of Preventive Measures', in: *Journal of Applied Security Research*, 4 (4), 483-500.

Main arguments:

In this paper a range of implementation problems reported by end-users in the supply chain has been identified and listed. These implementation problems have been derived from a survey conducted as part of a targeted study into the effectiveness, efficiency and acceptability of the preventive measures defined in the European Air Cargo Security Program and in the TAPA (2007) Freight Security Requirements. By means of a series of semi-structured questionnaires, respondents were asked to report any implementation problems they had experienced, whether general in nature or specific to their own situation.

Based on the outcome of this exercise, an initial set of success indicators and an initial hypothesis on their impact on the effectiveness, efficiency and acceptability of situational measures was developed. The indicators listed in this section relate to: (1) the availability of a measure to end-users; (2) the required level of knowledge, expertise and guidance to assess, evaluate, prioritize and tackle crime problems; (3) the practicability of a measure to end-users; (4) its financial/economic cost; (5) its ethical/social cost; (6) the effort required for offenders to circumvent a measure; (7) its beneficial side effects; (8) any unintended reverse effects; (9) stakeholder/user belief in the (effectiveness of) a measure; and (10) stakeholder/user awareness of the problem on hand and their commitment to tackle it.

³⁷ Note: this chapter is an exact copy of the first research paper, published in the *Journal of Applied Security Research*. No changes have been made to its structure nor to its content.

It is argued that an 'ex ante' consideration of potential measures, and a thorough consideration of interdependencies, may prove to be extremely beneficial to the success of future programming. In this paper it is further argued that – in order to stress the importance of an ex ante consideration of preventive measures - it is essential to identify this consideration as a separate, individual stage in any program design, succeeding the production of an initial inventory of effective measures, and preceding the actual implementation phase.

Situational Crime Prevention and Supply Chain Security: An “Ex Ante” Consideration of Preventive Measures

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ABSTRACT

This article is about situational crime prevention in the (European) supply chain. It is based on a thorough analysis of two international supply chain security programs, and on the consequent observation that the security measures that form part of these programs can all be classified as situational techniques. One of the main conclusions of the research has been that an ‘ex ante’ consideration of preventive measures, and a careful consideration of any interdependencies, may prove to be extremely beneficial to the success of future programming. The outcome of these considerations can be applied to rank potential interventions, and decide on the most promising and feasible one(s). In order to facilitate a thorough consideration of the effectiveness, efficiency and acceptability of potential measures, a series of ‘success indicators’ was developed.

KEYWORDS

supply chain security measures / interdependencies / effectiveness / efficiency / acceptability

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Introduction

This paper grounds on a report produced under the Counteract Project of the European Commission¹. The main objectives of the project were to assess current practices in the fight against terrorism and to recommend feasible and cost-effective solutions for the improvement of security in key sectors of transport and energy. The Counteract project was funded within the European Union 6th RTD Framework Programme, started off in June 2006 and was to be terminated after 36 months. On behalf of the Directorate-General Transport and Energy of the European Commission a series of targeted studies was conducted, one of them focusing on the effectiveness and potential spill-over effects of counterterrorism measures in international supply chain security programs. One of the deliverables identified in the latter, was to comment on the effectiveness, efficiency and acceptability of the preventive measures defined in the European Air Cargo Security Program, and in the TAPA (2007) Freight Security Requirements. Relevant data on the measures' (perceived) effectiveness was obtained from 37 regulated agents listed in the Netherlands, from 3 major international express companies and from 7 users of the TAPA Freight Security Requirements. By means of a series of semi-structured questionnaires, respondents were asked to qualify the (perceived) effectiveness of the various measures, and report any implementation problems they had experienced, whether general in nature, or specific to their own situation. The findings derived from this exercise, together with the outcome of an extensive literature review, were consolidated into a set of 'success indicators' and a guide for future programming. One of the main conclusions of the study has been that an 'ex ante' consideration of preventive measures, together with a careful consideration of interdependencies, may prove to be extremely beneficial to the success of future programming.

The first part of this article briefly outlines some initiatives taken by US and EU government following the attacks of September 11, 2001, and further concentrates on the two programs under study. Part two outlines the methodology that was applied to classify

the preventive measures identified in both programs, and to develop the indicators to be used for considering their effectiveness, efficiency and acceptability. Based on the observation that both the European Air Cargo Security Program and the TAPA Freight Security Requirements primarily contain situational measures, the various stages that (should) form part of the design of a generic situational crime prevention project are discussed in the third part. The fourth and final part focuses on one particular stage in the design process, being the 'ex ante' consideration of potential measures and interdependencies.

(EU) Supply Chain Security Programs

In response to the disastrous attacks of September 11, 2001, federal and state governments globally have introduced programs that are designed to protect the public in general, and the supply chain in particular, against acts of unlawful interference. With the Aviation and Transportation Security Act², the Customs Trade Partnership against Terrorism³ and the Container Security Initiative⁴, the US Government set the scene for the introduction of a range of trans-border security initiatives. The European Union was soon to follow with the enforcement of a series of requirements covering all modes of transport. In December 2002 the International Ship and Port Facility (ISPS) Code was adopted as an amendment to the SOLAS Convention, describing minimum requirements for security of ships and ports. In 2004 this code was incorporated into European legislation.⁵ As the ISPS rules only cover the direct interface between the vessels and the landside, an additional Directive allowing for tailor-made processes in European ports was put into place.⁶ In the area of civil aviation and air cargo security, Regulation (EC) No 2320/2002⁷ enabled for a European framework with intense levels of security in the form of rules and measures with detailed, legally binding specifications and checks. The European Air Cargo Security Program has been in effect since January 19, 2003, and has recently been revised in order to seek further simplification, harmonisation and clarification of the existing rules, as well as improvement of the various levels of security.⁸ It is based on standards contained in ICAO⁹ Annex 17, recommendations of the European Civil Aviation Conference (ECAC)¹⁰, and Commission proposals. Chapter 6.1. of EU Regulation 2320/2002 states that all cargo, courier and express parcels intended to be carried on passenger or all-cargo aircraft, need to be subjected to security controls before being placed on board the aircraft.

When the cargo, courier and express parcels originate from a known or account consignor, and sterility of the shipments is maintained until the departure of the aircraft, these security controls need not be applied. The option to secure supply chains as provided for in the EU Air Cargo Security Program requires the consequent provision of a range of different statuses, such as the status of 'known consignor' (for passenger aircraft), 'account consignor' (for all-cargo aircraft) and 'regulated agent'. All of them have to adopt very specific and binding requirements and implement a range of preventive measures and controls in order to be able to guarantee a free flow of goods and services.

In an endeavour to regulate security in other forms of transport systems (i.e. rail and road transport, inland waterways and short sea shipping), and in order to complement existing Community transport security policies, the Commission issued a Communication and a Proposal for a Regulation on Enhancing Supply Chain Security.¹¹ This proposal has never been formalized into European legislation, in part because a similar initiative had been developed and enforced by the Customs Directorate of the European Commission. A set of security amendments to the Community Customs Code was published in May 2005¹², covering a number of measures to tighten security around goods crossing international borders, the requirement for traders to provide customs authorities with information on goods prior to import to or export from the European Union, the provision to introduce the Authorised Economic Operator (AEO) concept, and the introduction of a mechanism for setting uniform Community risk-selection criteria for controls.¹³ The total of supply chain security measures introduced in government programs is further complemented by a range of measures that form part of international standards (e.g. the ISO 28000-series)¹⁴, and various industry-driven security initiatives such as the Transported Asset Protection Association's Freight Security Requirements.¹⁵ The latter have been established by security professionals within the high-tech / high-value industry, and specify the minimum acceptable security standards for the protection of assets travelling throughout the supply chain, and the methods to be used in maintaining those standards. TAPA started off in the United States in 1997 and unites global manufacturers, freight carriers, law enforcement agencies and other stakeholders with the common aim of reducing losses from international supply chains. Suppliers can obtain TAPA certification if they meet or exceed the criteria detailed in the freight security requirements document.

Methodology

Two programs were selected in order to examine the effectiveness, efficiency and acceptability of supply chain security measures: the EU Air Cargo Security Program, designed to protect European civil aviation against acts of unlawful (terrorist) interference, and the TAPA (2007) Freight Security Requirements, a certification program that was specifically designed for theft prevention. In order to identify and classify the preventive measures in these programs, both were analysed to the level of each constituent part. From this exercise it became clear that all measures could be classified using the 25-category classification of opportunity-reducing techniques provided for by Clarke and his colleagues (Clarke and Eck, 2003; Cornish and Clarke, 2003; cited in Clarke, 2005: 46-47). The existing body of knowledge on situational crime prevention was reviewed as part of an extensive literature review, and based on the outcome of this review a series of 'success criteria' and an initial hypothesis on their impact on the effectiveness, efficiency and acceptability of situational measures, was developed. This hypothesis was put to the test using data obtained from 37 regulated agents listed in the Netherlands¹⁶, from the Aviation Security Managers of 3 major European express integrators, and from 7 users of the TAPA Freight Security Requirements. The findings derived from the literature review and the survey were consolidated and lead to the conclusion that an 'ex ante' consideration of potential measures, and a thorough consideration of interdependencies, may prove to be extremely beneficial to the success of future programming. Prior to describing the set of indicators that has been identified, the next part first introduces the consideration of potential measures as a separate (additional) stage in the design of any generic situational program.

Program Design Stages

According to Tilley (2005: 8) 'the commonsense problem-solving approach to crime issues suggests that we first scan the environment for existing and future problems, then subject them to careful analysis to figure out what might be done about them, and on the basis of this develop a strategy to address them, which is then systematically evaluated so that practice may be refined and failed approaches abandoned'. The same problem-solving methodology is used in problem-oriented policing¹⁷ (captured in the four-stage SARA

model)¹⁸ and in many other forms of social intervention (Clarke, 1997: 15). The standard methodology applied for designing situational projects, as outlined by Clarke, is ‘a version of the action research model in which researchers and practitioners work together to analyse and define the problem, to identify and try out possible solutions, to evaluate the result and, if necessary, to repeat the cycle until success is achieved’ (Lewin, 1947; cited in Clarke, 1997: 15). As such a generic situational crime prevention project comprises five stages¹⁹: (1) a collection of data about the nature and dimensions of the problem, (2) an analysis of the situational conditions that permit or facilitate the commission of the crimes in question, (3) a systematic study of possible means of blocking opportunities for these particular crimes, (4) the implementation of the most promising, feasible and economic measures, and (5) a (constant) monitoring of results and dissemination of experience (Gladstone, 1980, cited in Clarke, 1997: 15).

As Clarke and Eck (2003: 8-1) rightly argue, these design stages shouldn’t necessarily follow one another in a strictly linear fashion. An unfolding analysis can result in refocusing of the project, and questions about possible responses can lead to the need for fresh analyses. The longer and more complicated the project, the more iterations of this kind are likely to occur (Clarke and Eck, 2003: 8-1).

One requirement that is consistent throughout the cycle, is the need for proper analysis and proper data. Analyses can be undertaken at each stage of the process: analyses in the initial stages would focus on current and future crime problems and the socio-environmental contexts in which they (may) occur, while analyses in later stages would be concerned with the measurement of policy impacts, the attribution of observed changes to interventions, and the search for any policy side-effects such as displacement, crime switch, or the diffusion of benefits (Hirschfield, 2005: 632). Obviously proper analysis requires proper data. In practice data on crime problems are often hard to access, partial and inaccurate, and identifying patterns and underlying problems requires substantial understanding and skills (Tilley, 2005: 8). As Tilley continues, ‘the initially “obvious” can be quite mistaken and ill-thought through but well intentioned responses are capable of producing perverse and damaging effects’ (see further). Various tools are available to support this process of data gathering and interpretation: impact analyses, vulnerability scans, crime-centred analyses (CCA)²⁰, crime-environment analyses (CEA)²¹, crime script analyses²², etc.

Although various authors have stressed the need for an assessment of measures prior to their implementation (Goldstein, 1979; Clarke, 1997; Hirshfield, 2005), it remains unclear what criteria to use in order to select the ‘most promising, feasible and affordable’ ones. In order to stress the importance of an ‘ex ante’ consideration of preventive measures it is essential to identify this consideration as a separate, individual stage in any program design. Taking these comments on board, the next sections will briefly highlight the main activities covered in each stage of the (design) process.

Stage 1: Identification and definition of the problem and relevant stakeholders

A proper identification and clear definition of the (current or potential) problem on hand is essential in order to make a statement on the urgency and priority to tackle it, as well as the decision on appropriate strategies to intervene. If the problem definition is wrong to start with or important information is overlooked, then the whole process (and consequent decisions) can be compromised (Laycock, 2005: 682). As Gilling (1996: 19) argues, ‘misdiagnoses of crime problems can result from the failure to research the characteristics of crimes in sufficient depth’. For that reason it is important to collect and interpret as much data as possible on the nature of the problem, its extent and impact. Ekblom (1988, in: Gilling, 1996: 12) identifies this stage as ‘obtaining data on crime problems’. Berry and Carter (1992, in: Gilling, 1996: 12) refer to the need for ‘a clear understanding of the problem being addressed’. Once the (potential) problem has been identified and prioritised, it is essential to identify all relevant stakeholders and decide on the way forward. Morgan and Cornish (2006b: 33) define stakeholders as ‘private and public organisations or groups of people that will benefit if the problem is addressed, or may experience negative consequences or harm if it isn’t’. I would like to add those (groups of) individuals that may experience negative consequences or adverse effects if inappropriate measures are introduced to tackle the problem. Those individuals, groups of individuals, or organisations that are expected to play an active role in undertaking the measures defined in a program (e.g. transport companies requested to implement supply chain security measures), form a subgroup within the total stakeholder community. I will further refer to this subgroup as ‘users’.

Stage 2: Further analysis of problem and context

Once the crime problem has been identified, defined and prioritised, it is essential to further analyse the situational conditions that permit or facilitate the commission of the crime(s) under study, and the situational context and environment in which preventive action is required. Effective responses cannot be developed unless all factors contributing to the problem are known (Mayhew et al., 1976: 29; Hirschfield, 2005: 632; Morgan and Cornish, 2006b: 34).

Stage 3: (initial) Inventory of effective measures

As part of stage three, an inventory of effective measures²³, whether the most appropriate or not, is to be produced. According to Clarke (1997: 4) 'situational measures must be tailored to highly specific categories of crime'. 'For maximum effect, every specific kind of crime, including each variety of terrorism, requires its own analysis and its own tailor-made solutions [...] and usually a package of measures must be introduced' (Clarke, 2006: xi-xii).

Stage 4: Thorough consideration of potential measures

All too often, countermeasures that are thought of to be effective are identified and implemented without considering any potential side effects or interdependencies. These side effects and interdependencies (if any) will eventually come to the surface after the measures have been implemented (e.g. as part of the evaluation phase), resulting in the need for abandoning initial approaches, the need for adjustments or 'damage repair' or, even worse, forcing the conclusion that measures are totally ineffective and efforts and resources have been wasted. As Shapland (2000: 121) states, the weakness of having a full palette of measures to choose from is the difficulty of making the choice. Part four will cover this stage in more detail.

Stage 5: Implementation of the most promising measures

The actual implementation stage starts when all potential measures have been identified and considered, and a detailed implementation plan allowing for constant monitoring and an 'ex post' impact and process evaluation has been agreed upon with users and other stakeholders. According to Clarke (2008: 183) 'a situational project is more effective when it adopts a package of measures, each of which is directed to a particular point of the process to committing the crime'. It goes without saying that each individual measure within this package should be carefully considered prior to its implementation.

Stage 6: Evaluation and (constant) monitoring

The general purpose of evaluation is to provide feedback that will generate corrections to, and refinements in, crime prevention theory, policy and practice (Tilley, 2002: 1). Scientific evaluations are necessary in order to measure and establish the effects of a program. As such they are said to be 'a part of the remedy for exaggeration and overgeneralization of its efficacy' (Eck, 2002: 95). Four basic elements must be considered in all evaluations: interventions (i.e. the package of actions whose effectiveness the evaluation is supposed to determine), outcomes (i.e. the changes in target crimes or disorders), cases (i.e. the people or areas involved with crime) and settings (Shadish et al., in: Eck, 2005: 702). In most cases evaluations take place once the program has been implemented and settled for a certain period of time. It is important, however, to receive the feedback as soon as possible in order to allow for fine-tuning and, if necessary, more encompassing adjustments. A built-in monitoring system provides for these functions and can further be used for purposes of program evaluation (Gilling, 1996: 11).

Considering Interdependencies and Success Indicators

As indicated in the previous part, the design process explicitly stresses the need for considering all potential measures prior to their implementation. The value of an 'ex ante' consideration of situational measures is an obvious one: to estimate the effectiveness, efficiency and acceptability of a measure before it is actually implemented avoids that time and resources would be wasted and negative side effects would come into effect.

When all potential measures (i.e. solutions that are thought of to be effective) have been identified, each of them should be carefully scrutinized and potential interdependencies should be identified. The outcome of these considerations can be applied to help prioritise and rank them, and decide on the most promising and feasible option(s). When the cost-benefit calculus for a certain (set of) measures turns out negative, alternative measures should be (re)considered.

Interdependencies

The level of effectiveness or efficiency of a measure often depends on environmental conditions, and on the availability of other measures. It is of little or no use to install an electronic access control system with no access control procedures in place. Clarke (1997: 26) provides the example of security guards that rarely monitor CCTV systems as closely as designers would expect. Examples of interdependencies that have been reported in the Counteract Study are the need to combine locking devices for vehicles and trailers with proper security procedures and proper arrangements with subcontractors and suppliers, and the need to combine the installation of GPS or similar technology on vehicles with proper follow-up capabilities and procedures. Prior to deciding on what measures to implement, it is essential to recognize what interdependencies are obvious, and to verify how to overcome them.

Success Indicators

In order to facilitate the consideration of potential measures a series of ‘success indicators’ has been identified. The first indicator (availability) is of decisive importance: if a measure is not available to those who are expected to undertake/utilise it, it simply cannot be implemented (thus no effectiveness whatsoever). The other indicators are to be assessed (scaled)²⁴, and based on the outcome of the assessment a decision should be made regarding their effectiveness, efficiency and acceptability. Obviously the outcome for certain indicators will influence the outcome for others.

Indicator 1: Availability

A measure can be unavailable for a variety of reasons, e.g. because a certain technology is simply not available or supported in certain areas of the world, or because (local) law

doesn't permit its use or implementation. Staff vetting or (pre-)employment screening is a fine example of the latter. Although the rationale behind screening requirements is quite a logical one (i.e. 'don't let the bad guys anywhere near the target'), a lot of implementation problems related to (pre-)employment screening have been reported (n=7). These implementation problems refer to limited abilities to verify information across borders, limitations to check previous employment or criminal history due to privacy legislation, and the lack of access to the necessary information sources. According to some respondents, the implementation of security measures may further be opposed by works' council decisions (n=1), company policy (n=2) or local settings and arrangements with third parties or local authorities (n=3).

Indicator 2: Required level of knowledge, expertise and guidance

Implementing crime prevention measures requires a certain level of knowledge and expertise (and a commensurate level of guidance when the availability of the required level of knowledge and expertise cannot be taken for granted). The nature and number of businesses that are required to play a role in protecting the international supply chain highlight the vital importance of sufficient knowledge and expertise (and the potential lack of it). Whilst most international companies have people employed with a vast experience in tackling transport crime, this is not always the case for small and mid-sized enterprises, and even less for the thousands of shippers who, under total supply chain security management, would now become involved in securing their goods and premises. Proper guidance will prove to be essential. A poor understanding of available techniques to assess, evaluate, prioritise and tackle (crime) risks may render all efforts useless. Supply chain security measures that – according to some respondents - require specific guidance, are: the need for proper documentation of air cargo (n=3) and the consequent verification of this documentation upon receipt of the freight (n=2), the requirement to check the identity of persons delivering known freight (n=5), the obligation to screen consignments for prohibited articles (n=5), and the duty to perform (pre-) employment checks on staff (n=1).

Indicator 3: Practicability

Practicability refers to the degree to which a certain measure increases or decreases the convenience of everyday life and work. As Clarke (1997: 26) indicates, situational measures have sometimes failed due to technical or administrative ineptitude. For that reason it should be taken into account that those who are requested to implement a measure should reasonably be able to do so without impeding their core business processes to an extent that their execution becomes impossible. Examples of reported problems that refer to the practicability of implementation include difficulties encountered with organising security awareness training for all relevant categories of staff (n=5), inabilities to seal multiple stop pick-up and delivery vehicles (n=5), difficulties encountered with conducting a full identity check on persons delivering known freight (n=4), and with trying to limit the use of soft-sided trailers during peak season (n=1).

Indicator 4: Financial / economic cost

Security costs money and those implementing crime prevention measures will weigh the potential benefits against the costs involved. As Laycock (2005: 686) states, some ideal responses may be far too expensive to be acceptable in financial terms. It's important therefore that proposals are realistic and not over-ambitious or over-expensive.²⁵ Some examples of supply chain security measures that have been reported by a number of respondents as being very expensive, include: (x-ray) screening of cargo (n=8), the provision of security awareness training for staff (n=4), staff vetting (n=3), physical protection of building walls, roofs and (dock) doors (n=7), and organising full CCTV-coverage for warehouse and dock areas (n=4).

Indicator 5: Ethical / social cost

Solutions to prevent crime may be effective but that does not make them acceptable (von Hirsch et al., 2000, cited in Tilley, 2005: 5). By their very nature or when applied without reflection, preventive measures can easily turn into the negative and threaten the quality of our society. Certain members of our society may become labelled, feelings of intolerance and distrust may be stimulated, social conduct may be hindered, and human rights violated

(Vettenburg et al., 2003: 11-12). As argued by Duff and Marshall (2000: 23) 'any cost-effective measure brings some benefits and imposes some costs (such as the material resources required to implement it, the degree of inconvenience it creates, and its possible deleterious impact on such interests as freedom, autonomy or privacy)'.

The social and ethical acceptability of crime prevention measures depends on their non-discriminating character in imposing costs and/or burdens to all or just some individuals or groups within society (Duff and Marshall, 2000: 27), on the extent to which they tend to label certain groups or individuals or exclude them from our society. A thoughtless use of access control measures in public or semi-public spaces such as shopping malls, to give just one example, may result in the fact that individuals profiled as posing an increased risk may lose access to public spaces which formerly were accessible to all, without them having ever engaged in any disruptive or aggressive behaviour, or before having had the chance to show to be willing to behave properly (von Hirsch and Shearing, 2000: 89). Ethical and social costs further relate to feelings of intolerance and distrust that may be provoked. If an employer decides to introduce exit searches on employees as they leave work, not only the cost-effectiveness of this measure, but also the attitude it displays towards the employees should be questioned, as well as the conception it implies of their role in the enterprise in which they are engaged (Duff and Marshall, 2000: 22).

Ethical and social costs also relate to the imminence of a 'fortress' or 'Panopticon' society in which people, terrified by crime, become distrustful of one-another and barricade themselves in their homes and places of work (Davis, in Clarke, 1997: 37; Grabosky, 1996: 38; von Hirsch, Garland and Wakefield, 2000: vi). They relate to 'big brother' forms of (state) control in which people (have to) give up their right of privacy, or, more in general, to the fact that introducing certain measures may have a detrimental effect on the environment. As Buruma (2005: 4) argues, crime and security threats provoke (government) reactions that, although not intended, can cause other threats to, e.g., the freedom and liberties of citizen. Tilley (2005: 6) refers to proper concerns about the potential threats to civil liberties from intrusive surveillance methods or from brutal forms of punishment designed to deter offenders.

Ethical and social costs further relate to inequalities that result from, or are multiplied by, the introduction of measures that aren't affordable to all: 'would-be burglars turn their attention from well-protected houses to others which are less protected [...] or those who

lack the more sophisticated kinds of protection are less well protected and more at risk than those who have them' (Duff and Marshall, 2000: 25).

While the ethical and social cost of situational crime prevention is obvious in some cases, it shouldn't be ignored that not every measure is likely to be susceptible to the critical concerns raised above, and that 'people are willing to surrender some freedoms or endure some inconvenience in specific contexts if they gain protection from crime' (Clarke, 2005: 61). A good example of the latter is the general acceptance of the need for a series of additional precautions when checking-in on a passenger flight. A precautionary measure that was decided on as being too intrusive is the use of full body scanners at European airports. Plans to introduce these scanners have been deferred by the European Commission as they raised deep concerns about privacy.

Indicator 6: Ease of circumvention

This indicator relates to the efforts required for offenders to circumvent a measure that has been introduced, and is inversely proportional to the effectiveness of that measure. Not only the ease with which a certain measure can be circumvented is relevant, but also the costs associated with the modus operandi applied by offenders in order to circumvent it.

Indicator 7: Beneficial side effects

Another indicator that needs to be assessed (scaled) is the presence, or absence, of any beneficial side effects resulting from the implementation (e.g. diffusion of benefits, de-escalating effects, etc.). A reduction in thefts and losses, improved customer loyalty and employee commitment, higher supply chain visibility and improved efficiency, are just some examples of beneficial side effects (or 'collateral benefits') that are frequently referred to in literature as resulting from the introduction of (anti-terrorism) supply chain security measures (Rice and Spayd, 2005; Peleg-Gillai, Bhat and Sept, 2006).

Indicator 8: Reverse effects

Even more important in the cost/benefit calculus is the presence or absence of any reverse effects that may occur. As Grabosky (1996: 25) argues, the ways in which crime

prevention programs may become derailed are numerous and diverse. The most common side effects that are referred to in literature are effects of ('geographical', 'temporal', 'target', 'tactical' or 'crime type') displacement.²⁶ A variation on the displacement effect is what Grabosky refers to as 'escalating effects' of crime prevention measures or initiatives. In the course of combating crime, one may actually produce crime and, as such, do more harm than good. 'The frustration that results from blocked criminal opportunities may lead to excessive violence or to an instrumental reliance on more forceful means of goal attainment' (Marx, 1990, in: Grabosky, 1996: 27). To cite Veno and Veno: 'where intervention is warranted, it should be delivered in a manner that minimises the potential for escalation' (Veno and Veno, 1993, in: Grabosky, 1996: 27). Another variation of reverse effects is what Grabosky refers to as 'creative adaptation'. Some initiatives or measures may inspire adaptive behaviour on the part of offenders that can entail more inventive, devious or violent activity (Grabosky, 1996: 32). A fourth and final example that needs considering as part of the design stage of the program are 'unintentional enticement effects'. By dramatising certain aspects by means of, e.g., warning messages, one may actually advertise the behaviour in question, either by bringing it to the attention of those who would otherwise be oblivious or only vaguely aware, or by enticing the potentially rebellious (Grabosky, 1996: 28). Grabosky (1996: 30) also refers to this phenomenon as 'the forbidden fruit effect'.

Indicator 9: Stakeholder/user belief

It goes without saying that users will be less motivated to fully implement measures if they have no belief in their effectiveness (and vice versa). The counter-terrorism measures that are perceived by users of the EU Air Cargo Security Program as being the most effective ones, are: protecting known freight against unauthorized interference at all times (87,2% of respondents); providing access control to premises and designated areas where known freight is being prepared, handled or stored (79,5%); screening of consignments for prohibited articles (79,5%); protecting consignments against unauthorized interference during transport (78,9%) and staff vetting (78,9%).

Indicator 10: Stakeholder/user awareness and commitment

No discussion on crime prevention can be complete unless it takes account of potential resistance encountered (Sutton, 1996: 70). As Hirschfield argues: ‘the effectiveness with which crime prevention measures are deployed depends [...] on how receptive local communities are to having them in their area’ (Hirschfield, 2005: 631). The effectiveness (and success) of a measure will without any doubt depend on the level of awareness and commitment of its users. The level of commitment will depend to a great extent on the outcome of a proper consideration of some of the indicators discussed above. An average user will be less committed to (help) deploy a measure that requires a lot of (lacking) expertise to implement, that is extremely expensive or impractical, or that violates his right of privacy and freedom of movement, etc.

According to Laycock (2005: 686), one of the main reasons for implementation failure is that the agency expected to carry out the implementation has no direct interest in doing so, resulting in the fact that it won’t be committed to an extent that the program turns into a success. In ‘Designing out crime from products and systems’, Clarke and Newman (2005: 3) argue that ‘manufacturers have been particularly reluctant to act in the public interest when they profit from the crime; when they are scrambling to develop new products; when changes are costly, inconvenient or of unproven value; when the crimes are considered trivial and public concern is not high; and when solutions are controversial’. In general it is of major importance to organise the implementation of a (series of) measure(s) in such a way to neutralize or overcome as many acceptance problems as possible (NCPI, 2001: 153).

Conclusion

In order to combat terrorism the European Union Heads of State called for ‘the strengthening of all forms of transport systems, including the enhancement of the legal framework and the improvement of preventive mechanisms’.²⁷ According to the Council, the cowardly attacks on the rail system in Madrid served as a terrible reminder of the threat posed by terrorism to our society, and to the values on which the European Union is founded. A full implementation of measures to combat terrorism was declared to be ‘a matter of urgency’. This article is about situational crime prevention in the (European)

supply chain. It is based on a thorough analysis of two international supply chain security programs, and on the consequent observation that the security measures that form part of these programs can all be classified as situational techniques. Unlike more traditional criminological theories that are concerned with explaining why certain individuals are more likely to engage in criminal behaviour compared to others, situational crime prevention focuses on modifying the settings in which crime occurs. As the micro-level extreme of the environmental perspective, situational crime prevention puts the reduction of opportunities and the manipulation of the costs and benefits of crime to the fore as the bases for crime prevention (Wortley and Mazerolle, 2008b: 10).

Over the past decades, the environmental perspective has been gaining increasing traction among government officials and end-users in criminal justice agencies and private bodies. As indicated by Wortley and Mazerolle (2008a; 2008b: 2), much has to do with its applied focus and its focus on the current dynamics of crime. Academics cannot but recognize its growing influence and should be supportive in exploring and improving its potential, building on a long and firm tradition of research in social sciences and taking into account developments in other academic disciplines.

In this article it is argued that an 'ex ante' consideration of preventive measures may prove to be extremely beneficial to the success of (situational) crime prevention initiatives. Assessing the effectiveness, efficiency and acceptability of a measure before it is actually implemented avoids that time and resources would be wasted and negative side effects would come into effect. The outcome of this consideration can be applied to help prioritise and rank potential interventions, and decide on the most promising and feasible one(s).

A growing interest in social and ethical costs of situational crime prevention and in its potential reverse effects, to name but a few, is not only necessary, but may also prove to be the answer to some of the critiques that have been posted to adherents of the situational and environmental perspective.

NOTES

[1] Cluster of User Networks in Transport and Energy Relating to Anti-terrorist Activities, 2006–2009.

[2] Public Law 107-071 passed by the 107th Congress on November 19, 2001.

[3] The Customs Trade Partnership against Terrorism (C-TPAT) is a voluntary government-business initiative to build cooperative relationships that strengthen and improve overall international supply chain and U.S. border security. More info:

www.cbp.gov.

[4] The Container Security Initiative (CSI) was launched in 2002 by the U.S. Bureau of Customs and Border Protection in order to increase security for container cargo shipped to the United States.

[5] *Regulation (EC) No 725/2004 of the European Parliament and of the Council of 31 March 2004 on enhancing ship and port facility security*, Official Journal of the European Union, L 129/6, 29 April 2004.

[6] *Directive 2005/65/EC of the European Parliament and of the Council of 26 October 2005 on enhancing port security*, Official Journal of the European Union, L 310/28, 25 November 2005.

[7] *Regulation (EC) No 2320/2002 of the European Parliament and of the Council of 16 December 2002 establishing common rules in the field of civil aviation security*, Official Journal of the European Communities, L 355/1, 30 December 2002.

[8] *Regulation (EC) No 300/2008 of the European Parliament and of the Council of 11 March 2008 on common rules in the field of civil aviation security and repealing Regulation (EC) No 2320/2002*, Official Journal of the European Union, L 97/72, 9 April 2008.

[9] International Civil Aviation Organization. More info: www.icao.int.

[10] European Civil Aviation Conference. More info: www.ecac-ceac.org.

[11] Commission of the European Communities (2006) *Communication and Proposal for a Regulation of the European Parliament and of the Council on enhancing supply chain security*, COM (2006), 79,

www.ec.europa.eu/dgs/energy_transport/security/intermodal/doc/com_2006_0079_en.pdf,

(accessed 29 December 2008).

[12] *Regulation (EC) No 648/2005 of the European Parliament and of the Council of 13 April 2005 amending Council Regulation (EEC) No 2913/92 establishing the Community Customs Code*, Official Journal of the European Union, L 117, 4 May 2005.

[13] Taxation and Customs Union (n.d.) *Customs related security initiatives of the EU*, www.ec.europa.eu/taxation_customs/customs/policy_issues/customs_security/security_initiatives/index_en.htm, (accessed 29 December 2008).

[14] For more info: www.iso.org.

[15] For more info: www.tapaemea.com.

[16] From the research population (= a total of 257 companies listed as regulated agent in the Netherlands in July 2008), 37 completed and returned the questionnaire (= 14,39%). Respondents were asked to rate the perceived effectiveness of the various measures on a scale from '0' to '3', and to list and comment on the implementation problems they had experienced (free text input).

[17] 'Problem-oriented policing', introduced by Goldstein in 1979 and captured in the four-stage SARA model (i.e. 'Scanning', 'Analysis', 'Response' and 'Assessment'), reflects the same action research paradigm underpinning situational crime prevention (Goldstein, 1979, cited in Clarke, 1997: 9; Clarke and Eck, 2003: 5-1).

[18] The SARA model was originally developed by Eck and Spelman as a simple problem-solving tool that can help in addressing any crime or disorder problem (Morgan and Cornish, 2006b: 29). More recently Ekblom (cited in Clarke and Eck, 2003: 8-2) developed the SARA-acronym further into what he refers to as 'the 5 I's' ('Intelligence', 'Intervention', 'Implementation', 'Involvement' and 'Impact and process evaluation').

[19] Similar stages can be identified in Gill's Crime Risk Management Process, which is broader in scope and encompasses an assessment of the problem, a decision on the most appropriate strategy to deal with it and on the points or levels at which actions can be taken. The process further encompasses the implementation of those actions, as well as their evaluation (Gill, 1998: 14-15).

[20] Crime-centred analysis (CCA) uses a range of measurements and statistical techniques to identify the manifestation of crime and how it is changing over time, and includes analyses of its spatial distribution, its temporal patterns and how crime within one area compares with that elsewhere (Hirschfield, 2005: 637).

[21] Crime-environment analysis (CEA) examines the relationship between crime and aspects of the physical and social environment. It includes exploring links between crime

and community-level characteristics (e.g. disadvantage, community cohesion) and between crime and other factors such as land use, transport routes, the distribution of crime generators, crime attractors and, if available, crime prevention measures (Hirschfield, 2005: 637).

[22] Crime scripts describe the ways in which an offence unfolds and attempt to make explicit the series of decision points through which the would-be offender passes in the process of crime commission (Morgan and Cornish, 2006: 13). Cornish (1994, cited in Cornish and Clarke, 2008: 31) was the first to propose the concept of crime scripts to help identify every stage of the crime-commission process, the decisions and actions that must be taken at each stage and the resources required for effective action at each step. As Laycock argues, crime scripts can be useful in the response development process since they offer a mechanism for systematically working through the decision process, thus exposing a range of potential intervention points (Laycock, 2005: 682).

[23] Measures are effective if they have the desired effect or produce the intended result (definition derived from the Oxford Advanced Learner's Dictionary, fifth edition (1995), p. 370).

[24] Knowledge and experience obtained from previous projects or fellow academics and crime prevention practitioners will obviously be of major assistance in this consideration process.

[25] Whilst Clarke's classification of situational techniques comprises five different strategies (i.e. 'to increase the perceived effort', 'to increase the perceived risk', 'to reduce the anticipated rewards', 'to remove excuses' and 'to reduce provocations'), it is worth observing that the first two strategies have been found to be dominant in both programs under study. In order to widen the potential of situational crime prevention in the international supply chain it might be worth considering examining and/or introducing additional techniques that fall under the other strategic options. Alternative techniques may prove to be less expensive and/or less intrusive, which would tackle resistance or implementation problems faced by users.

[26] Displacement theory sees crime as being shifted around in five main ways: either moved from one place to another (i.e. 'geographical displacement'), moved from one time to another (i.e. 'temporal displacement'), directed away from one target to another (i.e. 'target displacement'), replacing one method of committing a crime by another (i.e.

'tactical displacement') or substituting one type of crime for another (i.e. 'crime type displacement') (Clarke and Eck, 2003: 13-1).

[27] Council of the European Union, *Declaration on combating terrorism*, Brussels, 25 March 2004.

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CHAPTER 2: RE-THINKING THE COST OF SUPPLY CHAIN SECURITY³⁸

Research paper: HAELTERMAN, H. (2011) 'Re-thinking the Cost of Supply Chain Security', in: *Crime, Law and Social Change*, 56 (4), 389-405.

Main arguments:

In this second paper the success indicators that were listed in Chapter 1 have been analyzed further and compared to the existing body of knowledge on situational crime prevention. Based on the outcome of an extensive literature review and consequent analyses, direct and indirect implementation costs have been differentiated from a range of (consequential costs provoked by) potential reverse effects, and from a series of generic preconditions, enabling practitioners in industry to conduct a proper cost analysis and come to an informed decision on what particular measure(s) best to implement.

Preconditions include the practicability and availability of a measure to end-users, as well as the knowledge and expertise that is required to evaluate and implement that measure. They further include end-users' awareness of the problem that is being dealt with, their belief in the effectiveness of the proposed solution(s), and their commitment to solve the problem and to co-operate with other stakeholders to reach the desired outcome. It is argued that the effectiveness and efficiency of a solution may be severely compromised if these preconditions are not or insufficiently met. Direct and indirect implementation costs refer to the financial, ethical and esthetical cost of a measure that is being considered. Financial (or monetary) costs cover the fixed and variable costs of investing in crime prevention. Social costs relate to the (perceived) impact of the introduction of a measure on civil liberties, convenience and conduct of staff, customers and other stakeholders; and esthetical costs relate to the (perceived) impact on the esthetics of the environment in which a measure is introduced.

³⁸ Note: this chapter is an exact copy of the second research paper, published in *Crime, Law and Social Change*. No changes have been made to its structure nor to its content. Only footnotes have been converted into end notes, as to maintain consistency throughout this manuscript.

Another factor that requires careful consideration in order to come to an all encompassing cost assessment, is the impact of a range of unintended consequences that may come into effect following the introduction of a certain (set of) measure(s). This impact may result from displacement, escalating, creative adaptation and/or enticement effects.

In this paper it is argued that – as part of a generic program design - the actual implementation stage should only start once all potential measures have been identified and considered, and a detailed implementation plan allowing for constant monitoring and an ‘ex post’ impact and process evaluation has been agreed upon with users and other stakeholders. It is further argued that criminology and management science can support the assessment and decision making process, provided that policy makers allow operators a certain freedom of choice between alternative measures and approaches.

Re-thinking the Cost of Supply Chain Security

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ABSTRACT

Post 9/11 we have witnessed the introduction and further strengthening of a range of trans-border security programs designed to protect international supply chains against acts of unlawful interference. In some cases compliance with these programs is mandatory. In other cases compliance results in a preferential treatment by appropriate authorities. To a great extent, these programs comprehend the introduction of situational measures. In most instances, however, operators within the supply chain – being made responsible for their actual implementation - are left with limited guidance. In this paper it is argued that a lack of guidance may result in measures being introduced without taking full account of their potential consequences. Based on an analysis of previous research findings and on the outcome of a literature review, direct and indirect implementation costs have been differentiated from a range of (consequential costs provoked by) potential reverse effects, and from a series of generic preconditions, enabling practitioners in industry to conduct a proper cost analysis and come to an informed decision on what particular measure(s) best to implement. It is argued that criminology and management science can support this decision making process, provided that policy makers allow operators a certain freedom of choice between alternative measures and approaches.

KEYWORDS

Supply chain security / situational crime prevention / preconditions / monetary and non-monetary costs / consequential costs

Introduction

‘What have you criminologists been doing all these years?’ This quote was taken from Martin Gill’s introduction to the first volume of ‘Crime at Work’ [1]. According to Gill, crime in the business environment had been a marginal concern for most criminologists at the time. Most tended to see crime and business solely in terms of corporate crime, white collar crime and fraud; while in reality virtually any crime can occur at the workplace; and the business or its staff, customers or contractors can either be the offender or the victim [1]. This paper highlights a similar concern, be it of a somewhat different nature.

Post 9/11 we have witnessed the introduction of a range of trans-border security programs designed to protect international supply chains against acts of unlawful interference [2-4]. The scene was set by US Government with the introduction of the Container Security Initiative (CSI), the Customs-Trade Partnership Against Terrorism (C-TPAT), and the Advanced Manifest Rule (AMR). In the European Union, the International Ship and Port Facility Security (ISPS) Code was adopted in December 2002 as an amendment to the SOLAS Convention, describing minimum requirements for security of ships and ports¹. In the area of civil aviation and air cargo security, Regulation (EC) No. 2320/2002 enabled for a European framework with intense levels of security in the form of rules and measures with detailed, legally binding specifications and checks², and in 2003 the European Commission communicated two main goals with respect to the future of customs authorities, introducing – amongst other – the European Authorized Economic Operator concept³. Over the past decade, most of these programs have been strengthened following further incidents and changing threat patterns provoking government and industry intervention.⁴ In some cases compliance to them is mandatory for operators in the logistics chain. In other instances compliance results in a preferential treatment by appropriate authorities, as is the case for the Authorized Economic Operator program that allows for reduced security checks by Customs and – as such - for a faster transfer of goods through so-called “green lanes” [2]. In all cases, operators are being made

responsible for the introduction of preventive controls, putting security and compliance high on the agenda and making them an integral part of contemporary supply chain management.

In most if not all instances, supply chain security programs comprehend the introduction of situational measures, and in many cases operators in the industry are left with limited guidance on how best to implement them [5]. A study conducted in 2009 into the effectiveness, efficiency and acceptability of situational crime prevention in international supply chain security programs, identified a series of costs and implementation problems reported by end-users [4-5]. In the same study it was argued that an 'ex ante' consideration of preventive measures may prove to be extremely beneficial to the success of future programming. This consideration is to take place prior to the actual implementation phase, and the outcome can be applied to help prioritize and rank potential interventions and to decide on the most promising and feasible one(s) [4]. It goes without saying that, in order to enable operators in the supply chain to consider alternative options, they must first be allowed a certain freedom of choice. This is currently the case in some but by far not all programs. As where customs supply chain security programs such as the European Authorized Economic Operator program clearly indicate the scope of the required interventions, leaving the decision on what particular safeguards to introduce open to some extent; business driven initiatives such as the TAPA Freight Security Requirements⁵ only list a range of very specific situational measures that need to be introduced in order to reach and maintain compliance.

The present paper further elaborates on the above and aims to identify what costs and preconditions need to be considered in order to come to an informed decision on what measure(s) best to implement. It aims to differentiate the cost components associated with the introduction of a specific measure from a range of reverse effects that may result in consequential costs; and from a set of preconditions that need to be in place in order for the introduction to be feasible and successful. The decision to focus on the costs of situational crime prevention is instigated by a genuine concern that operators risk to be left in the cold, and, out of ignorance or due to a lack of guidance, risk to implement measures without taking full account of its potential consequences. As an understanding of the situational calculus made by offenders in specific kinds of crime is the key to effective prevention [6], so is an understanding of the costs (and benefits) of the range of situational crime prevention measures to choose from. As Tilley [7] argues: "it should be clear that

crime prevention is ineluctably complex. This means that those for whom crime reduction or community safety is a specialist responsibility either as policy-maker or practitioner, need to have a broad grasp of the theory, evidence, circumstances, options, contexts, ethics and possible consequences of varying responses if they are to make informed decisions". It goes without saying that those responsible for implementing crime prevention programs within their industry or individual company require a commensurate level of knowledge, expertise and/or guidance.

The scope of the attached paper is limited to an identification and consideration of the cost of introducing situational measures. As such it aims to move away from a high level theoretical discussion on the pro's and contra's of situational crime prevention compared to more traditional criminological approaches, as well as from a debate on who should bear the cost of crime prevention. Although space limitations do not allow a detailed coverage of the situational perspective, it seems appropriate to provide a brief introduction to its theoretical base and to the set of situational techniques available to end-users.

Situational Crime Prevention

Most criminological theories have traditionally been concerned with explaining why certain individuals are more likely to engage in criminal behaviour compared to others. They refer to particular biological, biochemical or psychological dispositions or influences; inherited traits; a range of social factors or conditions such as poor education, poverty, inadequate socialization, weak bonds to society, weak morals; etc. [8-9]. Likewise, much crime prevention effort has gone into trying to lessen these dispositions or influences [7]. In recent decades, various criminological theories have influenced our understanding of the importance of settings and places in crime prevention efforts [10]. As Clarke [8] argues, they emphasize that the commission of a crime requires not only the existence of a motivated offender, but also the opportunity for crime. Situational crime prevention relates to the latter group of theories. As such it is an approach to crime prevention that focuses not upon changing offenders, but on modifying the settings (with its situational factors) in which crime occurs [8].

The concept of situational crime prevention was first introduced in the late 1970's by a team of scholars working in the UK Home Office [11]. Studies on institutional treatments for delinquents undertaken by the Home Office Research Unit provided a stimulus for the

founding of its theoretical base, together with two independent but related strands of policy research in the United States: Oscar Newman's concept of 'defensible space' (1972), and Jeffery's concept of crime prevention through environmental design (1971) [11]. The theoretical development of situational crime prevention was further strengthened by the development of routine activity and rational choice theory [11]. According to rational choice theory, offenders make rational decisions when carrying out a criminal act: if the costs of exploiting a criminal opportunity are perceived as being too high, or if an opportunity is reduced or removed altogether, the offender will cease the activity or look for another and better opportunity [12]. Routine activity theory argues that offenders are but one element in a crime, and perhaps not even the most important element. The routine activity approach emphasizes how illegal activities feed on routine activities: everyday life sometimes delivers temptations without controls [13]. According to Cohen and Felson 'crime occurs when a motivated offender and suitable target (or victim) converge in space and time in the absence of a capable guardian' [11]. Routine activity, rational choice and crime pattern theory – sometimes referred to as 'opportunity theories' [14] or 'crime theories' – all give an important role to situational factors in crime. Although somewhat different in focus, they provide a solid theoretical base for the concept of situational crime prevention: 'routine activity as a "macro" theory that seeks to explain how changes in society expand or contract opportunities for crime; crime pattern theory as a "meso" theory that seeks to explain how offenders seek or stumble across opportunities for crime in the course of their everyday lives; and the rational choice perspective as a "micro-level" theory that deals with the decision-making processes that result in an offender choosing to become involved in crime and selecting specific crimes to commit' [14].

The set of situational crime prevention measures or techniques has evolved quite significantly over the past years. The original formulation of situational crime prevention included an eight-category classification of opportunity-reducing techniques of which some had proven to be useful while the remainder required modification [11]. In his first edition of 'Situational Crime Prevention' (1992), Clarke presents a revised classification of twelve techniques, adding new categories and re-labelling existing ones. These twelve have later (1997) been expanded by Clarke and Homel to sixteen, including a new category of 'removing excuses for crime'. Finally, in response to Wortley's remarks on controlling situational precipitators [15-16], Cornish and Clarke (2003) expanded the techniques further to twenty five by including a category 'reducing provocations'. As such

the classification of preventive techniques has grown in step with the expanded theoretical base of situational prevention [14]. Table 1 provides a full overview of situational techniques, listed under five basic strategies: (1) increasing the perceived effort, (2) increasing the perceived risk, (3) reducing the anticipated rewards, (4) removing excuses and (5) reducing provocations.

Table 1: Situational Crime Prevention Techniques (Clarke, 2005: 46-47)

Increase the effort	Increase the risks	Reduce the rewards	Reduce provocations	Remove excuses
Harden targets	Extend guardianship	Conceal targets	Reduce frustration and stress	Set rules
Control access to facilities	Assist natural surveillance	Remove targets	Avoid disputes	Post instructions
Screen exits	Reduce anonymity	Identify property	Reduce emotional arousal	Alert conscience
Deflect offenders	Utilise place managers	Disrupt markets	Neutralise peer pressure	Assist compliance
Control tools / weapons	Strengthen formal surveillance	Deny benefits	Discourage imitation	Control drugs / alcohol

Research design

In order to develop an overview of potential costs associated with the introduction of situational crime prevention in a business environment, previous research findings were combined with the outcome of a thorough literature review, covering the existing body of knowledge on situational crime prevention. Cost factors and implementation problems that had been identified earlier in a study conducted into the effectiveness, efficiency and acceptability of situational crime prevention in the international supply chain [5], were compared with those identified in literature, and combined into an all encompassing inventory. This initial inventory was then analyzed further in order to differentiate (financial, ethical and esthetical) implementation costs from a range of potential reverse effects (i.e. consequential costs resulting from the implementation), and from a series of generic preconditions that relate to the introduction of preventive measures in general. These have then be incorporated into a conceptual model designed to identify the scope of an ex ante consideration of the various cost components in a generic program design. Finally it was explored to what extent criminology and management science can be of any

benefit in enabling policy makers and practitioners to conduct a proper cost analysis and come to an informed decision on what particular measure(s) best to implement.

Implementation problems and (consequential) costs

As part of a study conducted in 2009 into the effectiveness, efficiency and acceptability of situational crime prevention in the international supply chain, operators with relevant experience in implementing the European Air Cargo Security Regulations and the TAPA (Transported Asset Protection Association) Freight Security Requirements were asked to qualify the (perceived) effectiveness of the various measures, and to report on any implementation problems they had experienced [4-5]. The study revealed a series of costs and implementation problems relating to the availability of certain measures that are required by policy makers (e.g. limited abilities to verify information across borders and legal limitations to conduct pre-employment or criminal history checks); to their practicability and impact on core business processes; to the (financial and human) resources required to implement and maintain them; and to their negative impact on the (perceived) freedom of movement and privacy of staff [4]. They further relate to the level of knowledge and expertise required for assessing, evaluating, prioritizing and tackling criminal risks; to the level of (user) belief in their effectiveness; and to the level of awareness and commitment of end-users and other stakeholders [4]. Similar concerns have been raised in criminological literature on situational crime prevention, both by its advocates and critics. These concerns relate to a variety of areas such as to the financial, ethical and esthetical cost related to the implementation of situational measures; and to various reverse effects that may result from the implementation (see *infra*). As argued by Duff and Marshall [17], the introduction of any measure ‘brings some benefits and imposes some costs, such as the material resources required to implement it, the degree of inconvenience it creates, and its possible deleterious impact on such interests as freedom, autonomy or privacy’.

Financial (or monetary) costs relate to the fixed and variable costs associated with the implementation of a certain measure⁶. A review conducted into the monetary costs and benefits of thirteen situational crime prevention projects reported on between 1977 and 1999, focused on a range of cost items such as management and overhead costs, personnel costs (e.g. wages of surveillance staff, ...), capital expenditures, cost of (security)

equipment and services, maintenance costs, etc. [18]. Often the implementation of security controls in a business environment has an impact on certain core processes (e.g. the introduction of X-ray screening, which delays the normal operating procedure and therefore adds additional costs to the import or export process). Obviously the cost resulting from that impact needs to be taken into account in the total (monetary) cost calculation. As Laycock [19] rightly states, some ideal responses may be far too expensive to be acceptable in financial terms. It is important therefore that proposals are realistic and not over-ambitious or over-expensive. Furthermore, being expensive in financial terms does not qualify as a guarantee for success. As Gill [1] argues, the most effective crime prevention measures are often cheap or even free. It has long been established, for example, that signs of occupancy are the factor most likely to deter potential burglars of a domestic dwelling, making the encouragement not to leave a note of absence on the front door, or not to let the newspapers build up in the letter-box, an effective and cost-efficient preventive measure [1]. In any case, the monetary cost of introducing a certain measure should be carefully measured and balanced against the cost of alternative solutions, as measures that may initially be thought of as being less expensive than alternative options, may actually prove to be the contrary, as illustrated in a study on the cost of electronic article surveillance in retail stores, where it was found that the cost of tagging goods eventually proved to be the equivalent of employing a full-time member of staff for 52 weeks [20].

Solutions to prevent crime may be effective and cost-efficient, but that does not automatically make them acceptable without further consideration. When applied without reflection, or by their very nature, preventive measures can easily backfire and lower the quality of life in our society. Certain members of society may become labeled, feelings of intolerance and distrust may be stimulated, social conduct may be hindered, and human rights violated [21-22]. Translated into a workplace environment, staff members may feel labeled and discriminated, or hindered in their freedom of movement, alienating them from their colleagues and from their employer. Privacy rights may become violated, feelings of intolerance and distrust may be provoked, etc. As Duff and Marshall [17] put it, 'if an employer decides to introduce exit searches on employees as they leave work, not only the cost-effectiveness of this measure, but also the attitude it displays towards the employees should be questioned, as well as the conception it implies of their role in the enterprise in which they are engaged'. Other examples from literature that illustrate the potential *social*

(or ethical) cost of situational crime prevention in a workplace environment, include a thoughtless use of access control measures in public or semi-public spaces such as shopping malls, resulting in the fact that individuals profiled as posing an increased risk may lose access to public spaces which formerly were accessible to all [23]; the application of CCTV in retail security which may be seen by customers and staff as operating to the detriment of privacy, free association and other civil liberties [24]; monitoring one's activity on the Internet [16]; and passenger profiling at airports which may involve the violation of personal freedom [25]. With its use of electronic hardware, the concept of situational crime prevention raised the spectre of totalitarian, "big brother" forms of state control [11]. While the ethical and social cost of situational crime prevention is obvious in some cases, it shouldn't be ignored that not every measure is likely to be susceptible to the critical concerns raised above, and that 'people are willing to surrender some freedoms or endure some inconvenience in specific contexts if they gain protection from crime' [14]. A good example of the latter is the general acceptance of the need for additional precautions when checking-in on a passenger aircraft [14].

Apart from their financial and social cost, certain measures may have a negative impact on (the esthetics of) the environment and, as such, pose an additional cost compared to those that are equally effective but blend in with their surroundings. Examples of *esthetical costs* derived from literature include the installation of floor-to-ceiling turnstile railings in subway stations, creating a prison-like, 'draconian' environment [8]; gating-off pay phones in public spaces to prevent shoulder surfing [26]; or the installation of bollards or shutters outside listed buildings or in older market towns [27].

Finally there has been extensive publishing on various *reverse effects* that may result from the implementation of situational crime prevention, effects that – again – may result in a range of consequential costs. As Grabosky [28] argues, the ways in which crime prevention programs may become derailed are numerous and diverse. The most common side effects that are referred to in literature are effects of displacement [22, 7-8, 10]. This is the phenomenon where the introduction of preventive measures results in crime being displaced elsewhere (i.e. 'geographical' or 'spatial displacement'), to some other time or target (i.e. 'temporal' or 'target displacement'), being committed in another way (i.e. 'tactical displacement'), or being substituted for some other kind of offense (i.e. 'crime type', 'functional' or 'offence displacement') [11]. Target, tactical and crime type displacement have been examined in studies on the introduction of steering column locks

to prevent car theft [29-30], and on the value of anti-bandit screens to prevent post office robberies [31]. Temporal displacement has been analysed in studies on the effectiveness of bike patrols to prevent auto theft in commuter lots [32], and of improved street lighting [33]; and geographical displacement has been addressed in studies on the introduction of caller-ID to deter obscene phone callers [34] and on the use of CCTV [35-36], to cite but a few. Furthermore, one may actually produce crime and do more harm than good in the course of combating it. As Marx argues, ‘the frustration that results from blocked criminal opportunities may lead to excessive violence or to an instrumental reliance on more forceful means of goal attainment’ [28]. As an example, escalating effects have been examined in studies on check frauds in Sweden [37]; on robbers’ perceptions of enhanced security measures [35]; and on decision-making practices of armed robbers [38]. Some initiatives or measures may inspire adaptive behaviour on the part of the offenders that can entail more inventive, devious or violent activity [14, 28]; or by dramatising certain aspects of unwanted behaviour, one may actually advertise that behaviour, either by bringing it to the attention of those who would otherwise be oblivious or only vaguely aware, or by enticing the potentially rebellious, as indicated by Morrison and O’Donnell in their study on offender’s decision-making processes [28, 38].

Further analysis and classification

Further analysis enables us to list the above under three broad categories: a set of generic preconditions; a range of financial, ethical and esthetical costs related to the implementation of a measure; and a number of potential reverse effects that may result from that implementation (see *infra*). While the first are common to any intervention, the latter two are specific to the measure that is under consideration (see also Table 2).

Table 2: Preconditions, costs and reverse effects

Pre-conditions (general)	Costs (specific)	Reverse effects (specific)
Availability	Financial / monetary cost	Displacement
Practicability	- Fixed	- Geographical
Required knowledge		
Required expertise	- Variable	- Temporal
User awareness		
User belief	Ethical / social cost	- Target
User commitment	- Labelling / discrimination	- Tactical
Co-operation	- Distrust	- Crime type
	- Civil liberties	Escalating effects
	- Inequalities	Creative adaptation
	Esthetical cost	Enticement effects

Certain *preconditions* need to be in place in order for any intervention to be effective. This is the case for the practicability and availability of a measure to end-users, as well as for the knowledge and expertise that is required to evaluate and implement it. Sampson et al. [39] report on measures that have been proven ineffective because too little attention had been paid to their practicability for major stakeholders, e.g. innovations that left senior citizens trapped inside a fortress of heavy doors and electronic card-key devices which they found difficult to understand and to operate, while neighbors were no longer able to keep a friendly eye on them. Other issues related to the practicability of preventive measures are highlighted in studies on property marking [40] and on schemes to defeat vandalism [8].

If a measure is unavailable (e.g. because local law does not permit its use or implementation), it simply cannot be introduced. If a measure is available to the end-user but its introduction would impact core business processes to an extent that their execution becomes extremely difficult or impossible, there is little guarantee for success. As Beck and Willis argue, there is a delicate balance to be struck between meeting security imperatives and maximizing business opportunities [41]. The same applies when the implementation of a certain measure requires a level of knowledge or expertise that is unavailable to or hard to obtain for the end-user. A poor understanding of available techniques to analyze the crime problem or to implement security measures and evaluate their effectiveness and efficiency may render all preventive efforts useless. As Knutsson

and Clarke put it, ‘seemingly simple measures can be rather difficult to implement for a variety of technical, managerial and social reasons’ [42]. Whilst major international supply chain operators have staff employed with a vast experience in tackling transport crime, this is not always the case for small and mid-sized enterprises, and even less for the thousands of shippers who, under total supply chain security management, become involved in securing their goods and premises.

Other preconditions include the need for end-users to be aware of the problem that is being dealt with, to belief in the effectiveness of the proposed solution(s), and to be committed to solve the problem and to co-operate with other stakeholders to reach the desired outcome. Those who need to initiate action need to be aware of their responsibility to do so. They need to be committed to act, and to achieve the necessary coordination among all parties concerned. Especially the latter can prove to be quite challenging. Effective crime prevention is often about partnership, in that ‘each of the players has a role which complements and must be coordinated with the others in a system of mutual co-operation’ [43]. As illustrated by Newman and Clarke in a case study of the reduction of credit card fraud, there are numerous cases where situational crime prevention has succeeded through forging partnerships among the crucial players [16], and the fact that a lack of commitment or co-operation causes preventive action not to reach its full potential is clearly illustrated in a study on ram raiding where it was discovered that police recording practices and a lack of commitment of some retailers made it difficult to collect useful data to tackle the problem [27]. As Tilley points out, ‘competing demands on the organizations and individuals belonging to them; differences in philosophy, culture and organizational style; a lack of dedicated resources; differences over leadership; a historic lack of trust; an apparent indifference or apathy amongst some; and so on; all conspire to create obstacles to the operation of effective formal partnerships’ [7].

A first set of cost components specifically relates to the introduction of a certain measure that is under consideration. This is the case for its *financial*, *ethical* and *esthetical costs*. As argued before, monetary costs cover the fixed and variable costs of investing in crime prevention. Social costs relate to the (perceived) impact of the introduction of a measure on civil liberties, convenience and conduct of staff, customers and other stakeholders; and esthetical costs relate to the (perceived) impact on the esthetics of the environment in which a measure is introduced.

Finally, another factor that requires careful consideration in order to come to an all encompassing cost assessment, is the impact of a range of unintended consequences that may come into effect following the introduction of a certain (set of) measure(s). As outlined in Table 2, this impact may result from *displacement*, *escalating*, *creative adaptation* and/or *enticement effects*.

A conceptual model for an ex ante consideration of preventive measures

The standard methodology applied for designing situational projects is ‘a version of the action research model in which researchers and practitioners work together to analyse and define the problem, to identify and try out possible solutions, to evaluate the result and, if necessary, to repeat the cycle until success is achieved’ [8]. As such a generic situational crime prevention project comprises five stages: a collection of data about the nature and dimensions of the problem; an analysis of the situational conditions that permit or facilitate the commission of the crimes in question; a systematic study of possible means of blocking opportunities for these particular crimes; the implementation of the most promising, feasible and economic measures; and a (constant) monitoring of results and dissemination of experience [8].

A proper identification and clear definition of the problem at hand is essential in order to make a statement on the urgency and priority to tackle it, as well as the decision on appropriate strategies to intervene. If the problem definition is wrong to start with or important information is overlooked, then the whole process (and consequent decisions) can be compromised [19]. Once the crime problem has been identified, defined and prioritised, it is essential to further analyse the situational conditions that permit or facilitate the commission of the crime(s) under study, and the situational context and environment in which preventive action is required. Consequently, an inventory of effective measures, whether the most appropriate or not, is to be produced. Each of these measures should be carefully scrutinized, and potential interdependencies identified⁷. The outcome of this ex-ante consideration can be applied to help prioritise and rank alternative interventions, and to decide on the most promising and feasible option(s). When the cost-benefit calculus for a certain (set of) measures turns out negative, alternative measures can be (re)considered. As outlined in Figure 1, the actual implementation stage should only start when all potential measures have been identified and considered, and a detailed

implementation plan allowing for constant monitoring and an ‘ex post’ impact and process evaluation has been agreed upon with users and other stakeholders. The latter may adopt a range of methods such as randomised control trials, simulations, examination of detailed expected outcome footprints and regression discontinuity designs; and may be conducted in the interest of informing policy decisions, to inform practitioners’ and policymakers’ decisions when faced with a new situation, and/or in the interest of taking a field of applied knowledge forward [44].

Figure 1: Conceptual Model



Cost modelling

In this final section it is argued that management science and criminology can be of much assistance in enabling practitioners in industry to conduct a proper cost analysis and come to an informed decision on what particular measure(s) best to implement. Management science has traditionally been concerned with building explicit models for analysis and managerial decision making [45]. According to Moore and Weatherford [45], a ‘learning-from-modelling’ approach allows managers to address the most important issues of any decision-making situation, including the choice what alternative options to investigate and to implement. Models can be used to abstract the problematic aspects of a management situation, often involving conflicting or competing alternatives, into a quantitative model that represents the essence of the situation. As such, modelling can be of much assistance to those assessing the (benefits and) costs of alternative preventive measures. When having to decide on what measures to implement to prevent unauthorized access to the loading compartments of pick-up and delivery vehicles – a requirement that forms part of various anti-theft and anti-terrorism security programs – one could decide on fitting door alarms and GPS modules on all vehicles or, as a combined or alternative option, go for the human factor approach and decide to provide recurrent training to all drivers making them aware of the need to lock their vehicles at all times and check the loading compartment after having made any scheduled or unscheduled stops. For both options a number of cost factors can easily be translated in a deterministic model. This is the case for all aspects that are known with a reasonable amount of certainty (e.g. financial costs). These costs can be depicted in total or - at least the majority of them – divided over time costs and distance costs, a practice that is quite common in contemporary transport and logistics management [46].⁸ The total monetary cost for the first option (i.e. the ‘technological’ approach) equals a range of fixed and variable costs including the purchase of the electronic devices, the installation and maintenance cost, the cost for internal or external monitoring of alarms and consequent interventions, and communication costs. For option 2 (i.e. the ‘human factor’ approach), fixed and variable monetary costs include the cost of providing trainers, training facilities and training material, the recurrent cost of replacing drivers who are participating in the training, etc.

The assessment of ethical and esthetical costs presents a challenge and requires a somewhat different approach. To a certain extent it remains a normative discussion, but,

notwithstanding that, criminology and management science can provide tools that allow for incorporating the assessment into the decision making process on what measures best to implement. In the academic debate on the cost of crime, several methods have been proposed to estimate intangible or non-monetary costs such as those invoked by pain and suffering [47]. These include methodologies such as contingent valuation, which involves probing potential victims on how much they would be willing to pay in order to avoid the pain and suffering associated with a crime [48]; and the methodology applied by Von Hirsch and Jareborg [49] in an effort to categorize the harms of crime. The latter methodology focuses on assessing the impact of a crime on the victim's standard of living⁹, identifying four generic-interest dimensions upon which crime intrudes: physical integrity, material support and amenity, freedom from humiliation, and privacy or autonomy [49]. Where these methods prove to be effective in assessing the social cost of crime, they can obviously be adjusted and applied to assess the social (ethical) or esthetical cost of crime prevention. The relative importance that stakeholders (e.g. management, unions or staff members) attribute to ethical and esthetical cost components can be determined e.g. by means of stated preference research [50]. Although this research has been criticized as depicting behaviour which is hypothetical and not observed in reality [51], it allows for estimating attributes on which revealed preference data is not (yet) available.

An ex ante consideration of (the impact of) potential reverse effects is even more challenging as these effects will only present themselves after the measures have been in place for a certain period of time. Offenders confronted with vehicle alarms may turn their attention to other, unsecured, vehicles (target displacement), or try to gain access to the load in another way (tactical displacement), perhaps by means of excessive violence (escalating effects). As Hamilton-Smith argues, 'measuring displacement [...] is particularly difficult because attributing the occurrence or non-occurrence of one crime to the prevention of another is ostensibly a somewhat speculative pastime' [12]. This is not to say that displacement and other reverse effects are completely unpredictable. Analyzing all available information on (potential) offenders, victims and offense locations at the very outset of a project may provide useful input for modelling patterns of offending and for considering how they might be affected by the introduction of a given crime reduction measure [12]. One needs to identify what criminal opportunities are left unattended once a measure has been introduced, and try to anticipate how the offender might attempt to

circumvent or counter that measure. Although it may be impossible to predict every possible permutation in offender behaviour, one should at least attempt to identify potential temporal, spatial, target, tactical and offence changes. In order to do so, reliable data is crucial. For that reason it is of extreme importance to constantly obtain, archive and analyse as much detail as possible on incidents that occur within the organisation or – in this case – within the supply chain.

Finally, apart from trying to predict (the impact of) unintended consequences of the introduction of crime prevention measures during the design phase of the program, it is also extremely important to be vigilant for their manifestation once the program is in place. Even if crime reduction measures do not lead to any reverse effects in the short term, the monitoring of crime patterns and trends may reveal more long term adaptations by offenders to blocked opportunities or illuminate the exploitation of new opportunities [12]. For that reason a built-in monitoring system is essential to the long term success of any program.

Conclusion

Post 9/11 we have witnessed the introduction and further strengthening of a range of trans-border security programs designed to protect international supply chains against acts of unlawful interference. Specific programs have been introduced for nearly all modes of transport, including air, road and maritime; and to a great extent they comprehend the introduction of situational crime prevention measures. In most instances, however, operators within the supply chain – being made responsible for the actual implementation - are left with limited guidance. In this paper it is argued that such lack of guidance may result in measures being introduced without taking full account of their potential consequences. It is argued that the cost of introducing preventive measures entails not only the financial or monetary costs associated with the implementation, but also a range of other cost factors such as ethical and esthetical costs, or consequential costs invoked by potential reverse effects coming into play once a measure is introduced. This paper further identifies a range of generic preconditions that need to be in place in order for the introduction of a measure to be feasible and successful. The latter relate to the availability and practicability of a measure that is under consideration, to the knowledge and expertise

required to implement it, to the level of (user) belief in its effectiveness; and to the level of awareness and commitment of end-users and other stakeholders.

It is argued that the various cost components that have been identified, need to be assessed as part of an ex ante consideration of the various measures that are deemed effective to mitigate the problem on hand, as this consideration would enable policy makers and practitioners in industry to come to an informed decision of what particular measure(s) best to implement. Considering actual and potential costs can assist to help prioritize and rank potential interventions, and to decide on the most promising and feasible ones. When trying to incorporate this ex ante consideration into the standard methodology applied for designing situational projects [8], it would succeed the production of an initial inventory of effective measures, and precede the actual implementation phase [4].

It is further argued that criminology and management science can be of much benefit in enabling practitioners to conduct a proper cost analysis and come to an informed decision on what particular measure(s) best to implement. Deterministic cost models can be applied for those aspects that are known with a reasonable amount of certainty (e.g. financial costs). Ethical and esthetical costs can be determined by means of stated preference research, or by applying research methods that have been introduced to assess the (non-monetary) cost of crime; and consequential costs invoked by effects of displacement or other reverse effects can, at least to a certain extent, be predicted through analyzing all available information on (potential) offenders, victims and offense locations at the very outset of a project.

The value of considering preventive measures before they are actually implemented is an obvious one, as it avoids that time and resources would be wasted and negative side effects would come into effect. In order to enable this process, those responsible for implementing a program should be allowed a certain freedom of choice between alternative measures and approaches. The latter is currently the case for some but by far not all programs, and clearly constitutes an area for improvement.

NOTES

[1] This code was incorporated into European legislation with Regulation (EC) No. 725/2004 of the European Parliament and of the Council of 31 March 2004 on enhancing ship and port facility security, OJ, L 129/6, 29 April 2004.

[2] Regulation (EC) No. 2320/2002 of the European Parliament and of the Council of 16 December 2002 establishing common rules in the field of civil aviation security, OJ, L355/1, 30 December 2002.

[3] Commission of the European Communities, Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee on a simple and paperless environment for Customs and Trade and on the role of customs in the integrated management of external borders, COM (2003) 452, Brussels, 24 July 2003.

[4] As an example, recent interceptions of improvised explosive devices originating from Yemen have triggered US and EU governments to further enhance air cargo security regulations.

[5] The TAPA Freight Security Requirements (FSR) have been established by security professionals within the high-tech industry to address the nature by which high-tech products and materials are handled, warehoused and transported as they move throughout the supply chain (source: www.tapaemea.com, accessed 18 November 2010).

[6] Fixed costs are expenses that are not dependent on the level of goods or services produced or sold, while variable costs are considered to be expenses that change in proportion to the activity of a business (source: <http://www.accountingtools.com>, accessed 9 November 2010).

[7] According to Clarke (2008: 183) 'a situational project is more effective when it adopts a package of measures, each of which is directed to a particular point of the process to committing the crime'. It goes without saying that each individual measure within this package should be carefully considered prior to its implementation, and any potential interdependencies should be recognized and overcome prior to the actual implementation.

[8] Time costs are imputed on the basis of the duration of a transportation movement, distance costs according to mileage (source: Blauwens, De Baere and Van de Voorde, 2002: 73).

[9] Standard of living is defined as the economic means and non-economic capabilities for achieving a certain quality of life (Von Hirsch and Jareborg, 1991: 7-11).

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CHAPTER 3: CONTROLLING ACCESS TO PICK-UP AND DELIVERY VANS: THE COST OF ALTERNATIVE MEASURES (CASE STUDY)³⁹

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'Controlling Access to Pick-up and Delivery Vans: the Cost of Alternative Measures',
accepted for publication in the *European Journal on Criminal Policy and Research*.

Main arguments:

In this paper the application of the conceptual model that was developed in Chapter 2 is illustrated by means of an ex ante consideration of alternative measures to control unauthorized access to pick-up and delivery vans, a requirement that forms part of various anti-theft and anti-terrorism supply chain security programs. This application was conducted in a Belgian, relatively small branch of an international express operator.

As to identify and define the problem on hand, and as to list a number of risk mitigating measures, an initial focus group meeting was organized with the security representatives of the branch. Following this session, nine measures were perceived effective and selected for further consideration. As to assess the non-monetary cost of the proposed measures, and as to verify whether the necessary preconditions are in place to make their introduction a success, a survey was conducted amongst the full population of van drivers working for the branch. Finally, as to assess the perceived potential for displacement and other reverse effects, a second focus group meeting was conducted with the security representatives that participated in the initial session.

The outcome of the study reported on in this chapter illustrates that – when deciding on what measures best to implement - it may be worthwhile or even necessary not to focus on monetary costs only, but to also take a number of other cost items into consideration; and to make sure that a number of preconditions are in place in order for the introduction of a measure to be feasible and successful.

³⁹ Note: this chapter is an exact copy of the third research paper, accepted for publication in the *European Journal on Criminal Policy and Research*. No changes have been made to its structure nor to its content. Only footnotes have been converted into end notes, as to maintain consistency throughout this manuscript.

It is further argued that an ex ante consideration of alternative solutions will contribute to making the decision on what measures best to implement a more informed and balanced one.

Controlling Access to Pick-up and Delivery Vans: the Cost of Alternative Measures

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ABSTRACT

Over the past decade – following the disastrous attacks of 9/11 - we have witnessed the introduction of a range of trans-border security programs designed to protect international supply chains against acts of terrorism. In most if not all cases, these programs comprehend the introduction of situational measures, and in many cases operators in the industry are left with limited guidance on how best to implement them. In academic literature on situational crime prevention it is argued that – when introduced without proper reflection and consideration – preventive measures can easily backfire and turn into the negative. It is argued that measures need to be carefully assessed prior to their implementation, and that this assessment should focus on various criteria. In the study reported on in this paper, these observations are illustrated by means of an ex ante consideration of alternative measures to control unauthorized access to pick-up and delivery vans. This study was conducted in 2011 in a Belgian branch of an international express operator, and is limited to the selection process of preventive measures only. The

outcome illustrates that – when deciding on what measures best to implement - it may be worthwhile or even necessary not to focus on monetary costs only, but to also take a number of other cost items into consideration; and to make sure that a number of preconditions are in place in order for the introduction of a measure to be feasible and successful. It is argued that an ex ante consideration of alternative solutions will contribute to making the decision on what measures best to implement a more informed and balanced one.

KEYWORDS

supply chain security (programs) / situational crime prevention / preconditions / monetary costs / non-monetary costs / consequential costs

Introduction

Post 9/11 we have witnessed the introduction of a range of trans-border security programs designed to protect international supply chains against acts of unlawful interference. In the European Union, the International Ship and Port Facility Security Code was adopted in December 2002 as an amendment to the SOLAS Convention, describing minimum requirements for security of ships and ports¹. In the area of civil aviation and air cargo security, Regulation (EC) No. 2320/2002 enabled for a European framework with intense levels of security in the form of rules and measures with detailed, legally binding specifications and checks², and in 2003 the European Commission communicated two main goals with respect to the future of customs authorities, introducing – amongst other – the European Authorized Economic Operator program³. Over the past decade, most of these programs have been strengthened following further incidents and changing threat patterns that provoked government and industry intervention⁴. In most if not all cases, supply chain security programs comprehend the introduction of situational measures, and operators within the supply chain are increasingly being made responsible for the introduction of preventive controls, with no or limited guidance on how best to select and implement them. This raises the concern that, out of ignorance or due to a lack of guidance, operators risk implementing measures without taking full account of its potential consequences. As Tilley (2005: 10) argues, crime prevention is ineluctably

complex, meaning that “[...] practitioners need to have a broad grasp of the theory, evidence, circumstances, options, contexts, ethics and possible consequences of varying responses if they are to make informed decisions”. Concerns raised by both advocates and critics of situational crime prevention cover a variety of areas such as the financial and ethical cost associated with the implementation of preventive measures. Some ideal responses may be far too expensive to be acceptable in financial terms (Laycock 2005: 686); and when applied without reflection, or by their very nature, preventive measures can easily backfire and lower the quality of life in our society. Certain members of society may become labeled, feelings of intolerance and distrust may be stimulated, social conduct may be hindered, and human rights violated (Vettenburg et al 2003: 11-12; Newburn 2007: 296). As argued by Duff and Marshall (2000: 23), the introduction of any measure “[...] imposes some costs, such as the material resources required to implement it, the degree of inconvenience it creates, and its possible deleterious impact on such interests as freedom, autonomy or privacy”. Concerns are also raised with regard to various reverse effects that may⁵ result from the implementation of preventive measures. The most common side effects that are referred to in literature are effects of displacement (Eck and Weisburd 1995: 19; Clarke 1997: 38; Bowers and Johnson 2003: 276; Tilley 2005: 6; Newburn 2007: 582; Guerette 2009: 2). This is the phenomenon where the introduction of preventive measures results in crime being displaced elsewhere (i.e. ‘geographical’ or ‘spatial displacement’), to some other time or target (i.e. ‘temporal’ or ‘target displacement’), being committed in another way (i.e. ‘tactical displacement’), or being substituted for some other kind of offense (i.e. ‘crime type’, ‘functional’ or ‘offence displacement’) (Clarke 1992: 22; Bowers and Johnson 2003: 276; Guerette and Bowers 2009: 1333). Furthermore, one may actually produce crime and do more harm than good in the course of combating it. As Marx (1990, in Grabosky 1996: 27) argues, ‘the frustration that results from blocked criminal opportunities may lead to excessive violence or to an instrumental reliance on more forceful means of goal attainment’. Some initiatives or measures may inspire adaptive behaviour on the part of the offenders that can entail more inventive, devious or violent activity (Clarke 2005: 53; Grabosky 1996: 32); or by dramatising certain aspects of unwanted behaviour, one may actually advertise that behaviour, either by bringing it to the attention of those who would otherwise be oblivious or only vaguely aware, or by enticing the potentially rebellious (Grabosky 1996: 28).

In an attempt to identify the various components that should form part of a cost assessment of situational measures, and based on previous research combined with an extensive literature review, Haelterman (2011) classified the above concerns under two broad categories; and differentiates them from a set of generic preconditions that need to be in place in order for any intervention to be effective (see Table 1).

Table 1: Preconditions, costs and reverse effects (Source: Haelterman 2011: 397)

Pre-conditions (general)	Costs (specific)	Reverse effects (specific)
Availability	Financial / monetary cost	Displacement
Practicability	- Fixed	- Geographical
Required knowledge		
Required expertise	- Variable	- Temporal
User awareness	Ethical / social cost	- Target
User belief	- Labelling / discrimination	
User commitment		- Tactical
Co-operation	- Distrust	
	- Civil liberties	- Crime type
		Escalating effects
	- Inequalities	Creative adaptation
		Enticement effects
	Aesthetical cost	

A first set of cost components comprehends the *financial*, *ethical* and *aesthetical costs* of a specific measure that is under consideration. Financial (or monetary) costs cover the fixed and variable costs of investing in crime prevention. Ethical costs relate to the (perceived) impact of the introduction of a measure on civil liberties, convenience and conduct of civilians, staff, customers and other stakeholders; and aesthetical costs relate to the (perceived) impact on the aesthetics of the environment in which a measure is introduced. A second set covers the impact of a range of unintended consequences that may come into effect following the introduction of a certain (set of) measure(s). As outlined in Table 1, this impact may result from *displacement*, *escalation*, *creative adaptation*⁶ and/or *enticement effects*. Finally, a number of preconditions need to be in place for any intervention to be successful. These include the *availability* and *practicability* of a measure to end-users, the level of *knowledge* and *expertise* that is required to implement it; the need for end-users to be *aware* of the problem that is being dealt with; their *belief* in the effectiveness of the proposed solution(s); and their *commitment* to (help) solve the problem and to *co-operate* with other stakeholders to reach the desired outcome.

Haelterman (2011: 399) further argues that both these preconditions and cost components need to be assessed as part of an ex ante consideration of the measures that are deemed effective to mitigate the problem on hand, as this consideration would enable policy makers and practitioners to come to an informed decision of what particular measure(s) best to implement.

In this paper the above is illustrated by means of a study into the selection process of potential measures to control unauthorized access to pick-up and delivery vans, a requirement that forms part of various supply chain security programs, and at the same time addresses an important business need. The study was conducted in 2011 in a Belgian, relatively small branch of an international express operator. The branch that was selected operates 45 pick-up and delivery vans daily, six of them owned by the company and 39 owned by a number of subcontractors⁷. Being part of an international organisation serving over 200 countries and territories, the express operator has a vast interest in complying with international security standards and regulations; and controlling access to consignments forms part of its standard operating procedures.

The main objective of the study is to identify the various cost components of a number of alternative measures that have been identified as being effective to mitigate the problem on hand, and to illustrate the benefit of taking these into account when deciding on what measures best to implement. The scope of the study is limited to the selection process of preventive measures only, and does not cover the actual implementation and ex post evaluation phase. Its main objective is to illustrate the process of considering situational measures prior to their actual implementation. As such, it should not be considered a detailed study into the potential effectiveness (or reverse effects) of situational measures available to operators to tackle security risks in the pick-up and delivery process, as this would require additional research, a broader study sample and a more in-depth analysis and comparison of relevant incident data.

Following a description of the applied methodology, the structure of the paper follows the various stages that are defined as constituting the standard methodology applied for situational crime prevention projects (Clarke 1997: 15). Part two provides detail on the problem that was selected and on the objectives to tackle it. In part three a range of mitigating measures is identified and listed. Before coming to a summary of the main conclusions, parts four to seven deal with the actual consideration of these measures,

assessing the relevant preconditions, their monetary and non-monetary cost, as well as any (potential) consequential costs.

Methodology

As to identify and define the problem on hand, and as to list a number of risk mitigating measures that are thought of to be effective, an initial focus group meeting was organized with the security representatives of the branch⁸, moderated by the researchers (Cronin 2001: 165). A focus group methodology was selected as it enables to explore participants' views and experiences in full depth. As to remain free of researcher influence, a low to medium level form of moderation was obtained for (Cronin 2001: 166).

As to assess the non-monetary cost of the proposed measures, and as to verify whether the necessary preconditions are in place to make their introduction a success, a survey was conducted amongst the full population of van drivers. Out of a total of 45 drivers, 23 returned a completed (structured) questionnaire, resulting in a response rate of 51,11 %. The first part of the questionnaire contained a range of questions on the background variables of the respondents. A minority of those that responded is female (8,7%); and 52.2% of the respondents was between 30 and 40 years old at the time of the survey. About two thirds (68,2%) was working as a subcontractor, the other third was directly employed by the operator⁹. The second part of the questionnaire contained a series of statements on which the respondents were asked to give their personal opinion. Each item was scored on a one to five point Likert scale (Procter 2001: 111-112). The statements used were carefully worded as to make sure that they had a maximum content validity. Prior to presenting the survey to the drivers, a small-scale pretest was conducted by presenting the questionnaire to a colleague familiar with the context. After having incorporated some minor recommendations that came out of the pretest, the questionnaire was presented to the drivers during a group meeting. During this meeting the drivers were presented some basic information on the aims and scope of the study, as well as some instructions for completing the questionnaire. To motivate them for completing the entire survey, their importance to the overall study was accentuated. It was further stressed that cooperation was on a voluntary basis only, and they were given a name of an independent contact person to reach out to in case they wanted additional information on the scope and objectives of the study¹⁰.

The drivers were initially given one week to return the completed questionnaire in a blank and closed envelope. The answers provided by the respondents were then inserted in an SPSS data-file. The individual items on the drivers' opinions were summed up to build a relevant scale. The reliability of these scales was tested by means of Cronbach's alpha, and items were excluded when this brought down the value of alpha (Bijleveld 2007: 232). The scales were also tested on their one-dimensional character. The scores of the respondents on these scales were then interpreted to form the conclusions.

Finally, as to assess the perceived potential for displacement and other reverse effects; a second focus group meeting was planned with the same security representatives that participated in the initial session. This research method was selected due to the limited number of participants and the high level of verbal and cognitive skills of the individuals involved. The participants were informed of the goal of the focus group and then left to interact, with the researchers acting as the moderator. This setup enabled to gather a lot of information in a limited time frame. For each of the proposed measures it was assessed to what type of displacement its introduction might potentially lead, based on past experience and knowledge gained from specialist literature and intelligence sharing within the sector. Following this exercise, the various measures were ranked by each individual participant according to their perceived potential for other reverse effects.

Problem analysis and definition

Defining and analysing the (potential) problem on hand is probably one of the most important and often most underestimated stages in any crime prevention effort. As Laycock (2005: 682) argues, if the problem definition is wrong to start with or if important information is overlooked, then the whole crime reduction process may be compromised. The crime problem under consideration in this paper relates to the risk of individuals gaining unauthorized access to (the loading compartments of) pick-up and delivery vans when operated on the public road (i.e. not when parked at the premises of the operator, consignor or consignee). Protecting cargo from unauthorised interference is not only relevant from an anti-terrorism perspective, as offenders may try to introduce prohibited articles inside that cargo, but obviously also from an anti-theft perspective; hence why controlling access to loading compartments (such as vans, containers or trucks)

is put forward as a strict requirement in both government as industry-driven security initiatives.

Looking at the standard process of the organisation in which the study was conducted, vans are mainly operated on week days between 9.00 AM and 5.00 PM. During that period, drivers make a range of scheduled stops to either pick-up or deliver consignments. On average, each driver services 47 collection and/or delivery addresses per day, resulting in - on average - a total of 2115 scheduled stops daily for the entire research population¹¹. Apart from the scheduled stops, drivers evidently have to make a number of additional comfort stops, e.g. to take their lunch break, or forced stops in case of illness or technical problems encountered with the vehicle. Although the number of unscheduled stops is extremely limited, it cannot be overlooked when assessing the overall risk.

In order to assess the importance of controlling access to pick-up and delivery vans to the operator, a focus group meeting was organised with a number of its security representatives. The main objective identified by the group, is theft prevention. In this context, theft can relate to the theft of the actual vehicle; the consignments on board of that vehicle; the cargo documentation; and/or cash retrieved from cash deliveries. Other objectives are to prevent the introduction of illegal items such as improvised explosive devices or narcotics in the supply chain; to limit insurance premiums; to ensure the safety and security of drivers; to reduce reputational risks to the company; and – last but not least – to achieve and maintain regulatory compliance (e.g. compliance with air cargo security regulations). Although there is no record of any breaches highlighted by the competent civil aviation authority to date, the latter objective alone makes the protection of air cargo a top priority to the company, as losing its regulated agent status would have a direct impact on business continuity.

Prior to identifying the range of measures that could be introduced to mitigate the risk of individuals gaining unauthorized access to the vans and/or their loading compartments; available data on previous victimization was gathered and analyzed¹². Of the total of consignments due for delivery between 1 January 2008 and 31 December 2010, 99 were reported (partially) missing, but the data did not reveal enough detail on the exact circumstances as to clarify whether or not the incident occurred on the public road whilst on board a pick-up and delivery van¹³. In one occasion, however, it was clear that a break-in took place while the driver was away from the vehicle making a delivery. The incident was reported to the police and clear signs of forced entry were found on the rear doors. At

the time of the incident, the vehicle was locked but not alarmed. Out of the 23 drivers that completed the questionnaire, two reported that a consignment had been stolen from their vehicle while working for the operator¹⁴. None of them experienced the vehicle itself having been stolen, nor any illegal or prohibited item having been introduced on board.

Potential measures for consideration

As part of the same initial focus group meeting, a list was compiled of potential measures that could be introduced to mitigate the risk. For each of these measures it was indicated whether or not it was perceived effective to reduce the risk of theft of the vehicle (or to increase the chances of recovering it after a theft would occur); to reduce the risk of theft of the content of that vehicle; and to reduce the risk of someone introducing illegal or prohibited items in the supply chain through gaining access to the pick-up and delivery vans. The measures that scored positive on all three objectives were selected as measures for further consideration. Although quite often the introduction of a combination of measures proves most effective in a situational project (Clarke 2008: 183)¹⁵, this consideration was conducted for each individual measure that was perceived effective by the security representatives of the organisation in which the study took place.

After having considered the evident precondition of *availability*¹⁶, the final list contained nine different measures: (1) the installation of automated locking devices on all vans, enabling that the cabin and cargo compartment doors automatically lock when the driver – holding a key card – approaches or moves away from the vehicle; (2) the installation of audible intrusion alarms, attracting attention when doors or windows are forced open; (3) the installation of silent intrusion alarms with remote (GPS) monitoring, allowing remote intervention upon receipt of an alarm; (4) issuing formal instructions to drivers (e.g. to always lock their vehicles when left unattended), combined with random compliance checks and a sanctioning system; (5) providing security awareness training to drivers (e.g. on vehicle security, secure parking, offender's modus operandi, etc.); (6) arranging two individuals (double drivers) for each vehicle, with one person staying in or nearby the van at all times; (7) providing overt security escorts; (8) removing company logos from vehicles in order to conceal the target; and (9) posting specific notifications on vehicles alerting the fact that no valuables are inside, or the fact that the vehicle is alarmed and

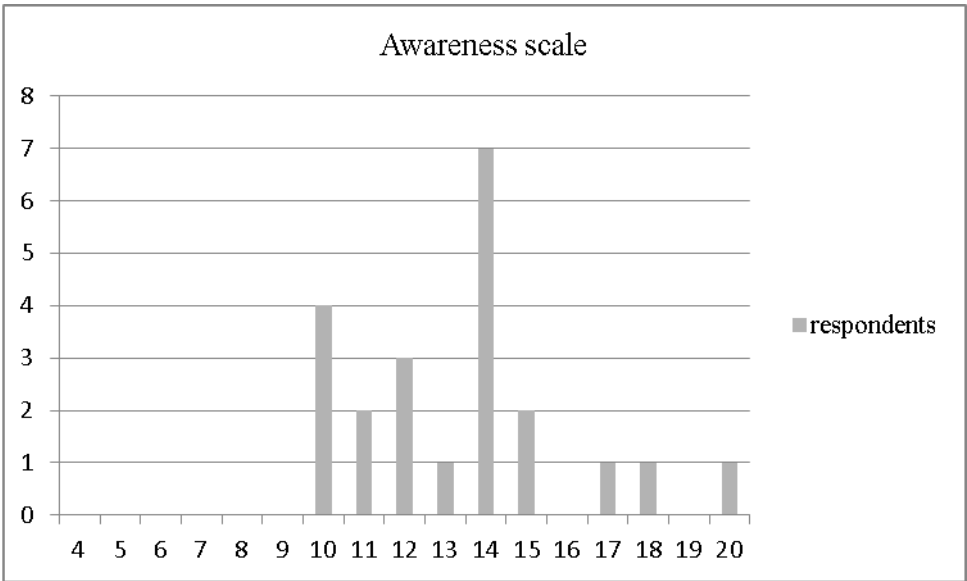
monitored at all times. No significant interdependencies¹⁷ have been identified between these nine measures.

Further analysis of preconditions

Apart from the availability of a measure to end-users, a number of other preconditions need to be in place in order for any intervention to be feasible and effective (Haelterman 2011: 397-398). This is the case for the practicability of a measure, as well as for the knowledge and expertise that is required to evaluate and implement it. Other preconditions include the need for end-users to be aware of the problem that is being dealt with, to believe in the effectiveness of the proposed solution(s), and to be committed to solve the problem and to co-operate with other stakeholders to reach the desired outcome (Haelterman 2011: 397-398).

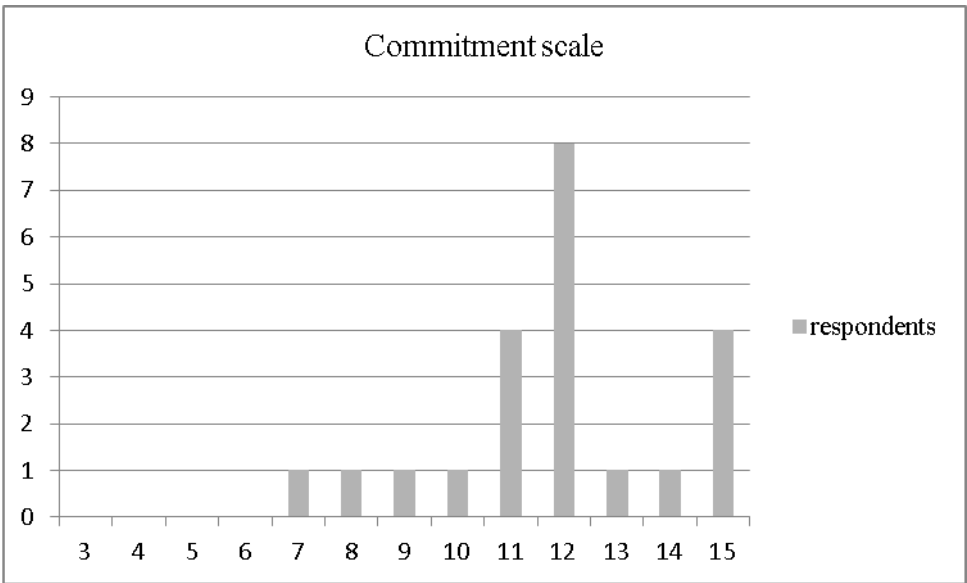
None of the measures that had been identified was considered to pose significant problems related to the level of *knowledge or expertise* required for implementation. Specific attention, however, was given to the level of awareness amongst drivers; to their commitment to contribute to mitigate the risk; to the perceived practicability of the proposed measures; and to the extent to which they believe them to be effective. In order to assess the level of *awareness* of the problem on hand (i.e. of the risk of unauthorized individuals gaining access to cargo and cargo compartments), drivers were asked to agree or disagree on a number of predefined statements. Because of the abstract character of the awareness concept, it was decided to establish an 'awareness scale' consisting of various items rather than to ask the drivers directly to what extent they are aware or unaware of the problem. Each item was scored on a one to five point Likert scale¹⁸. Figure 1 illustrates that the scores are unevenly distributed in the advantage of the higher scores as the respondents mostly agreed or fully agreed with the awareness statements. It should therefore be concluded that the respondents show a fair level of awareness¹⁹.

Figure 1: Awareness scale (i.e. driver awareness of the problem on hand)



The same methodology was applied to assess the level of *commitment* amongst drivers to (help) mitigate the risk of individuals gaining unauthorised access to cargo (see Figure 2). For this scale the sum of three items was used to define the level of commitment²⁰. The level could range from a score of ‘3’ (minimum level) to a score of ‘15’ (maximum level). Again, the outcome shows a predominance of the higher scores, indicating a high level of commitment amongst the group of respondents to help mitigate the problem.

Figure 2: Commitment scale (i.e. driver commitment to help mitigate the problem)



Taking a closer look at the individual questions that were used to establish the ‘commitment scale’, learns that nearly all (90,9%) of the respondents agree or fully agree that the driver is best placed (i.e. “the ideal person”) to protect the vehicle against unauthorized interference; and the majority of them is willing to assist in mitigating the risk. Only four out of the 23 respondents state that they should not be occupied with protecting their vehicle from unauthorized interference while performing their daily tasks. It goes without saying that users will be less motivated to fully implement a measure if they have no belief in its effectiveness, or when this measure would impact core business processes to an extent that their execution becomes extremely difficult or impossible (and vice versa). As to assess the extent to which the drivers believe in the effectiveness and the practicability of the proposed measures, they were asked to comment on a range of predefined statements for each individual measure²¹. A ‘belief scale’ was established for each measure, comprising five items, meaning that individual (total) scores can range from ‘five’ (minimum score) to ‘25’ (maximum score)²². In order to compare the different measures, the average scores of the total of respondents were calculated. Table 2 provides detail on the level of user *belief* in the effectiveness of the measures that were deemed appropriate to tackle the risk.

Table 2: User belief (in the effectiveness of the proposed measure)

Rank	Measure	Average score (on scale)
1	Key card	20,73
2	Audible alarm	20,39
3	Awareness training	16,65
4	Double drivers	16,26
5	Silent alarm + GPS	16,22
6	Overt security escorts	16,13 (modus 16)
7	Formal instructions	16,13 (modus 14)
8	Notification on vehicles	15,55
9	No company logos	13,41

The measures that came out most positive, include the installation of automatic locking devices on all vans (for example: 87% of the respondents agree or fully agree with the statement that the introduction of this measure would make it more difficult for an offender to gain access to the vehicle) and the installation of audible intrusion alarms (for example: 82,6% agree or fully agree with the statement that an alarm would deter potential

offenders). The measures perceived as being the least effective, are the removal of company logos (for example: 52,1% of the respondents consider this measure useless) and the provision of specific notifications on vehicles stressing the fact that no valuables are inside, or the fact that the vehicle is alarmed and monitored at all times.

The same methodology was applied to compare the measures on their perceived practicability. The practicability-scale was established for each individual measure, comprising four items, meaning that individual (total) scores can range from ‘four’ (minimum score) to ‘20’ (maximum score)²³. Table 3 provides detail on the extent to which the respondents perceive the proposed measures to be *practicable* or not. In order to compare the different measures, the average scores for the total of respondents were calculated for each measure.

Table 3: Perceived practicability of the proposed measure

Rank	Measure	Average score (on scale)
1	Key card	17,09
2	Audible alarm	15,61
3	Silent alarm + GPS	14,04
4	Notification on vehicles	13,83
5	Awareness training	13,04
6	No company logos	12,52
7	Formal instructions / compliance checks & sanctioning	11,52
8	Double drivers	10,65
9	Overt security escorts	09,96

The installation of automated locking devices comes out as the most practical measure (as perceived by the drivers). 87% of the respondents believe that this measure would even facilitate their job compared to the current situation. Other measures that are perceived favorable are the installation of audible alarms and the installation of silent alarms combined with off-site monitoring. The measures perceived as being the least practicable, are the provision of double drivers for each vehicle (for example: 45% of the respondents state that they would be hindered in their job if this measure would be introduced) and the provision of overt security escorts. 69,5% of the respondents disagree or totally disagree with the statement that the introduction of this measure would make their job any easier.

Monetary cost of selected measures

Financial (or monetary) costs relate to the fixed and variable costs associated with the implementation of a measure that is under consideration²⁴. These include a range of cost items such as management and overhead costs, personnel costs (e.g. wages of surveillance staff, ...), depreciation costs of (security) equipment, costs of services, maintenance costs, the cost resulting from the impact of security measures on certain core business processes, etc. (Welsh and Farrington 1999; Haelterman 2011: 394). For the purpose of this section, the total investment (in equipment, research, development, etc.) and the running costs per year have been assessed (see also table 4).

Table 4: Monetary cost of the proposed measure

Rank	Measure	Investment	Running cost per year ²⁵
1	Overt security escorts	-	€ 143000
2	Double drivers	-	€ 43200
3	Awareness training	€ 3750	€ 27375
4	Silent alarms with GPS monitoring	€ 31580	€ 21258
5	Key card	€ 33100	€ 15998
6	Audible alarms	€ 20547	€ 9931
7	Formal instructions & compliance checks	-	€ 8320
8	Notification on vehicles	Negligible	Negligible
9	No company logos	Negligible	Negligible

For some measures the monetary cost is negligible or extremely limited. This is the case for the removal of company logos or the provision of notification boards or - stickers. The provision of a second person accompanying the driver and the provision of overt security escorts solely result in additional (though substantial) personnel costs or costs of outsourcing a service to an external contractor (i.e. guarding company). The financial cost linked to the introduction of the other measures, results from a combination of equipment, installation and maintenance costs²⁶; personnel costs; management and overhead costs; the cost of external service providers; et cetera.

Conducting random checks to verify compliance with formal instructions imposed on drivers, results in an operational cost of 8320 Euros per year, based on one weekly check to be conducted by a qualified representative of the security department²⁷.

Taking into account the number of pick-up and delivery vehicles ($n = 45$), the investment that results from purchasing and installing automated locking devices on all vehicles totals around 33000 Euros²⁸. The equipment is subject to a three year depreciation period. Maintenance costs are estimated by the operator's facility department at 15% of the equipment cost per year, which brings the yearly running cost for this option to 16000 Euros.

Installing audible intruder alarms was assessed to amount up to an investment of 456 Euros per vehicle, totaling 20547 Euros for the entire fleet²⁹. Again, the equipment is subject to a three year depreciation period and the yearly maintenance cost is estimated at 15%. The yearly running cost totals 9931 Euros.

The cost of installing silent alarms with remote monitoring on the entire fleet results from an investment in the purchase and installation of the electronic devices, the maintenance cost (15%), the cost for external monitoring of alarms and consequent interventions, and communication costs. The cost of having the alarms monitored by an external monitoring room, equals an amount of 5994 Euros per year (for the entire fleet)³⁰. The total running cost for this option, amounts up to 21258 Euros yearly, the cost of interventions not taken into consideration.

The 'human factor' approach (i.e. providing staff with recurrent awareness training) presents a yearly investment for developing and upgrading the training package - estimated by the operator's training department at 3750 Euros - and a yearly running cost for delivering the training to the drivers. The latter includes the cost of providing trainers and training facilities; as well as the recurrent cost of replacing drivers who are participating in the training (i.e. 250 Euros per driver). The average cost of providing a security awareness session is estimated at 125 Euros per driver per year (taking into account an average of six participants per session), replacement cost not included. Taking into account an average staff turnover of 18 drivers yearly and the fact that recurrent training is required every year, the yearly (running) cost of training the full population of van drivers amounts up to 27375 Euros.

Non-monetary costs

Solutions to prevent crime may be effective and cost-efficient, but that does not automatically make them acceptable without further consideration. Staff members may feel labeled and discriminated, or hindered in their freedom of movement, alienating them from their colleagues and from their employer. Privacy rights may become violated, feelings of intolerance and distrust may be provoked, etc. (Haelterman 2011: 395). As to assess the *ethical / social cost* of the proposed measures, drivers were asked to comment on a range of predefined statements for each individual measure³¹. These statements relate to (1) the perceived impact on the driver's feeling of privacy, (2) their perceived feeling of trust or distrust towards their employer, (3) the perceived impact on their freedom of movement and (4) on their feeling of being treated equally. These four items composed the ethical cost-scale for each measure, meaning that individual (total) scores can range from 'four' (minimum score) to '20' (maximum score)³². Table 5 captures the overall outcome (i.e. average score on the ethical cost scale).

Table 5: Ethical cost of the proposed measure as perceived by the drivers

Rank	Measure	Average score (on scale)
1	Formal instructions / compliance checks & sanctioning	15,64
2	Overt security escorts	15,45
3	Double drivers	15,05
4	Silent alarms with GPS monitoring	13,95
5	Awareness training	13,50
6	Notification on vehicles	12,59
7	No company logos	12,14
8	Audible alarms	09,76
9	Key-card	09,64

Issuing formal instructions to drivers combined with random compliance checks and a sanctioning system is perceived as the measure with the highest ethical cost. Other measures that appear in the top-four, are the provision of security escorts, the provision of double drivers and the installation of silent alarms combined with remote (GPS) monitoring. The measures perceived as most favourable from an ethical perspective, are the installation of automatic locking devices and the installation of audible alarms. Table 6 provides detail on the various items that were measured.

Table 6: Ethical cost divided by item

Cost	Overall ranking	Privacy*	(dis)Trust*	Freedom of movement*	Equal treatment*
High	Formal instructions	Formal instructions (52,1%)	Formal instructions (47,8%)	Overt security escorts (63,7%)	Formal instructions (54,5%)
	Overt security escorts	Overt security escorts (47,8%)	Awareness training (39,1%)	Formal instructions (54,5%)	Double drivers (54,5%)
	Double drivers	Double drivers (43,4%)	Double drivers (39,1%)	Double drivers (50%)	Silent alarm + GPS (59,1%)
	Silent alarm + GPS	Silent alarm + GPS (34,7%)	Overt security escorts (39,1%)	Silent alarm + GPS (45,5%)	Overt security escorts (59,1%)
	Awareness training	Awareness training (26%)	Silent alarm + GPS (34,8%)	Awareness training (31,8%)	Notification on vehicles (59,1%)
	Notification on vehicles	No company logos (13%)	Notification on vehicles (26,1%)	Notification on vehicles (22,7%)	No company logos (63,7%)
	No company logos	Notification on vehicles (13%)	No company logos (26,1%)	No company logos (14,3%)	Awareness training (68,2%)
	Audible alarm	Audible alarm (8,6%)	Key card (17,4%)	Audible alarm (13,6%)	Key card (77,3%)
Low	Key card	Key card (4,3%)	Audible alarm (13,6%)	Key card (13,6%)	Audible alarm (81,8%)

* ranking based on % of respondents agreeing with statements that the measure poses a (perceived) ethical cost

The measures perceived as having the biggest (negative) impact on the driver's feeling of privacy, are the roll-out and monitoring of formal instructions, the provision of overt security escorts and the provision of two drivers for each vehicle. With regard to the perceived impact on the feeling of being (dis)trusted by their employer, the provision of formal instructions, the provision of awareness training and the provision of two drivers or security escorts score least favourable. The provision of overt security escorts, the roll-out of formal instructions, the provision of two drivers per vehicle and the installation of silent intruder alarms with remote (GPS) monitoring constitute the top-four of the measures that are perceived as having the most negative impact on the driver's freedom of movement and feeling of equal treatment. For all four items that were measured, the installation of automatic locking devices and the installation of audible alarms are perceived as posing the lowest ethical cost.

Apart from their financial and ethical cost, certain measures may have a negative impact on (the aesthetics of) the environment and, as such, pose an additional cost compared to those that are equally effective but blend in with their surroundings. In this study, no significant *aesthetical costs* were identified, apart maybe from having overt security escorts following each single vehicle every day of the week, which has a potential to invoke negative feelings to the general public living in the collection and distribution area.

Consequential costs

As Hamilton-Smith (2002: 16) argues, 'measuring displacement [...] is particularly difficult because attributing the occurrence or non-occurrence of one crime to the prevention of another is ostensibly a somewhat speculative pastime'. Nevertheless, the measurement and monitoring of displacement and other reverse effects should form part of the evaluation of any crime prevention project, as they may provide valuable input for future programming or for adapting a program that is still running.³³

Apart from the above, it is also essential to identify the possibility and likelihood of displacement and other reverse effects as part of the design phase of a project, be it to try and manage the occurrence upfront, or to provide input for the monitoring- and evaluation plan. According to Guerette (2009: 5), the fact whether or not displacement is likely to occur, will largely be determined by offender motivation, offender familiarity and crime opportunity. To effectively manage displacement at the outset of a program, one needs to

identify what criminal opportunities are left unattended once a measure has been introduced, and try to anticipate how the offender might attempt to circumvent or counter that measure. As Guerette (2009: 11-12) puts it, understanding the local displacement (and diffusion) potential requires a thorough analysis of the characteristics of targeted offenders, locations and victims.

As stated in the introduction, the latter (detailed) analyses do not form part of the scope of this study. The next table (Table 7) merely covers the potential for displacement as perceived by the security representatives that participated in the focus group meetings.³⁴

Table 7: Possible displacement resulting from the implementation (perceived by the focus group members)

Measure	Displacement possibilities
Automated locking devices + key card	<p>Offenders may try to gain access to the load in another way, perhaps by using forceful means to obtain key cards from drivers</p> <p>Offenders may try to invent possibilities to circumvent the technique (e.g. hack key cards / frequencies, manipulate van doors / locks, copy key cards, etc.)</p> <p>Offenders may try to get to the load when the driver is in the immediate proximity of the van, i.e. before the vehicle is locked, or by means of deceiving the driver (e.g. 'round-the-corner deliveries')</p>
Audible intrusion alarms	<p>Offenders may 'hit' on places with little social control</p> <p>Offenders may try to get to the load when the driver is in the immediate proximity of the van (i.e. before the alarm is activated)</p> <p>Offenders may try to circumvent the technique</p>
Silent intrusion alarms with remote (GPS) monitoring	Displacement effects may come into effect once it is widely known that the vans of operator x are alarmed
Formal instructions / compliance checks and sanctioning system	Limited to none
Security awareness training	Offenders may be inventive in trying to find modus operandi that were previously unknown to reach their goal
Double drivers	<p>Offenders may turn to more forceful means of goal attainment</p> <p>Offenders may try to get to the load by means of deceiving the drivers (e.g. 'round-the-corner deliveries')</p>
Overt security escorts	<p>Offenders may turn to more forceful means of goal attainment</p> <p>Offenders may try to get to the load by means of deceiving the escorts</p> <p>Offenders may strike when the escort vehicle is e.g. blocked in traffic</p>
Remove company logos	Limited to none
Post specific notifications	Offenders may turn to more forceful means to attain their goal when noticing the fact that vehicles are alarmed / protected

When asked to assess the potential for escalating effects, enticement effects or effects of creative adaptation, this potential was identified by a majority of the focus group members for six out of nine measures. A majority of them indicate that the installation of audible alarms, the provision of double drivers and the provision of security escorts may result in escalation; and all feel that providing double drivers or overt security escorts, or posting specific notifications on vehicles, may entice potential offenders (i.e. bring the fact that a courier van may be an attractive target to the attention of individuals who were previously not aware). Measures perceived as presenting the highest probability for escalating effects, enticement effects or effects of creative adaptation, are the provision of double drivers and the provision of overt security escorts. Table 8 presents the number of focus group members (out of a total of four) that indicated a potential for the given effect to occur.

Table 8: Perceived potential for escalating, creative adaptation and enticement effects.

Rank	Measure	Escalating effects	Creative adaptation	Enticement effects
1	Double drivers	3	3	4
2	Overt security escorts	3	2	4
3	Notification on vehicles	2	1	4
4	Audible alarm	4	2	1
5	Key card	2	4	0
6	Awareness training	2	2	1
7	Formal instructions	2	1	1
8	Silent alarm + GPS	1	3	0
9	No company logos	0	0	1

Conclusions

In academic literature on situational crime prevention it is argued that – when introduced without proper reflection and consideration – preventive measures can easily backfire and turn into the negative. It is argued that measures need to be carefully assessed prior to their implementation, and that this assessment should cover a range of cost factors and generic preconditions. The study reported on in this paper seeks to illustrate the potential benefit of this assessment by means of an ex ante consideration of a number of alternative measures to control unauthorized access to pick-up and delivery vans, a requirement that forms part of various supply chain security programs, and at the same time addresses an important business need. The scope of the study is limited to the selection process of

preventive measures only, and does not cover the actual implementation and ex post evaluation phase. The main objective is to illustrate the process of assessing situational measures prior to their actual implementation. As such, it should not be considered a detailed study into the potential effectiveness (or reverse effects) of situational measures available to tackle security risks in the pick-up and delivery process, as this would require additional research, a broader study sample and a more in-depth analysis and comparison of relevant incident data.

The outcome of the study illustrates that, when deciding on what measures best to implement, it may be worthwhile or even necessary not to focus on monetary costs only. Even though they present an extremely limited financial cost, certain measures may be considered questionable because of the fact that end-users have very limited belief in their effectiveness. In this study, this is the case for the removal of company logos. Other measures are perceived by end-users as being impracticable, hindering them in their daily jobs (e.g. the provision of double drivers), or as posing a high ethical cost. The latter is the case for the introduction of random compliance checks to monitor adherence to formal instructions and to sanction non-compliance. Drivers perceive this measure as having a negative impact on their feeling of privacy, their freedom of movement, their feeling of being treated equally, and on the relationship of trust that must exist between employer and employee. In this study, the measure perceived as the most practicable and effective one, and as posing the lowest ethical cost, is the installation of automated locking devices on all vans. Finally, certain measures may have an elevated potential for a range of unintended reverse effects. Based on the small study sample and the limitations of the data employed, this potential should be interpreted as a perceived potential, as a detailed determination of e.g. possible displacement effects requires much more research which does not fall within the scope of this particular study.

Based on the outcome of the study it is clear that an ex ante consideration of preconditions, monetary costs, non-monetary costs and consequential costs prior to deciding on what measure(s) best to implement, has the potential to avoid that time and resources would be wasted and negative side effects would come into effect once a measure has been introduced. Taking the recommendations set forth in this paper into consideration, will contribute to making the decision on what measures best to implement a more informed and balanced one. To be able to profit from this, policy makers should allow practitioners a certain freedom of choice between a set of alternative measures when

imposing requirements on them, as the various preconditions and cost components will be different within each individual setting. Translated to the topic of this paper, end-users in the supply chain should – to a certain extent – be allowed to introduce measures that best fit the setting in which they operate and, as such, assist regulators in reaching their objectives in the most effective and efficient way. Furthermore, as a proper consideration of alternative measures requires a certain level of theoretical understanding and skills that are not always available to all, it is recommended that end-users are offered additional guidance and support, e.g. by means of disseminating relevant incident data and research findings, by familiarizing them with some key concepts and techniques, or by funding additional research and evaluation studies.

NOTES

[1] This code was incorporated into European legislation with Regulation (EC) No. 725/2004 of the European Parliament and of the Council of 31 March 2004 on enhancing ship and port facility security, OJ, L 129/6, 29 April 2004.

[2] Regulation (EC) No. 2320/2002 of the European Parliament and of the Council of 16 December 2002 establishing common rules in the field of civil aviation security, OJ, L355/1, 30 December 2002.

[3] Commission of the European Communities, Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee on a simple and paperless environment for Customs and Trade and on the role of customs in the integrated management of external borders, COM (2003) 452, Brussels, 24 July 2003.

[4] As an example, interceptions of improvised explosive devices originating from Yemen in 2010, have triggered US and EU governments to further enhance air cargo security regulations and introduce additional safeguards to protect civil aviation.

[5] As argued by Bowers and Johnson (2003: 276), research indicates that crime displacement is not a necessary outcome of crime prevention activity, and it is also possible that crime reduction schemes may have a diffusion of benefits. Furthermore, it has been argued that even where displacement occurs, there may be some benefit to this (e.g. offenders choosing to commit less serious types of crimes than those prevented). A systematic review of 102 evaluations of situational crime prevention initiatives by Guerette and Bowers (2009) further supports the view that crime does not necessarily relocate in the aftermath of situational interventions.

[6] According to Clarke (2005: 53), the concept of adaptation refers to the process through which 'offender populations' discover new crime vulnerabilities after preventive measures have been in place for a while. It is a longer term process than displacement, which refers to the ways that 'individual offenders' find to circumvent preventive measures.

[7] Figures and further details were obtained from the Operations Manager of the branch.

[8] The focus group consisted of four members: the Head of Security, the Aviation Security Manager, the Manager Security Compliance and the Security Manager responsible for the local branch.

[9] The local Operations Manager, who has a clear view on all his drivers, could confirm that the spread of these background variables reflects the total spread in the targeted population. This means that the data used for further analyses was not substantially biased by a non-coverage problem.

[10] The company's official Confidant Advisor (i.e. 'vertrouwenspersoon') was asked to act as the central point of contact for the drivers.

[11] Info obtained from the operator's Engineering Department.

[12] Access to this data was granted by the Head of Security.

[13] The fact that a shipment is reported missing, can also relate to the fact that it had been delivered to the wrong address, or mistakenly swapped with another shipment due to some operational error.

[14] When the survey was conducted, 27,3% of the respondents had been working for the operator for less than one year. 36,4% had been working with the company between one and five years, and another 36,4% for more than five years.

[15] E.g. to optimize effectiveness in the example elaborated in this study, one can think of combining a measure that is tailored at making sure that van doors are locked at all times (e.g. card key) with one that is designed to detect intrusion (e.g. audible alarm).

[16] If a measure is unavailable (e.g. because local law does not permit its use or implementation), it simply cannot be introduced.

[17] There are no interdependencies if a measure can work on its own (i.e. without introducing additional measures). Examples of measures that are interdependent, are the installation of an electronic access control system and the introduction of access control procedures: just having the system installed without having access levels defined, will have no (or only a limited) effect.

[18] The one-dimensional character of the scale was confirmed with principal axis factoring (a single own value greater than one). This scale tested good on internal consistency with an acceptable Cronbach's Alfa value. Four items were withheld to build up the scale. See Appendix 1 for more detail.

[19] To interpret the scores one must keep in mind that the scale is internally consistent (meaning that individual respondents answered consistently high or low on the four items); that a score of 'four' suggests the lowest possible level of awareness; and that a score of '20' suggests the highest level of awareness possible.

- [20] The one-dimensional character of the scale was confirmed with principal axis factoring (a single own value greater than one). The scale tested good on internal consistency with an acceptable Cronbach's. See Appendix 1 for more detail.
- [21] Idem.
- [22] See Appendix 1 for more details on the properties of the scale.
- [23] Idem.
- [24] Fixed costs are expenses that are not dependent on the level of goods or services produced or sold, while variable costs are considered to be expenses that change in proportion to the activity of a business (source: <http://www.accountingtools.com>, accessed 9 November 2010).
- [25] Annual depreciation included.
- [26] The yearly maintenance cost for (security) equipment is budgeted by the operator's facility department at 15% of the total equipment cost.
- [27] Belgian private security legislation requires a private investigator's license for conducting (covert) compliance checks on drivers. Conducting one check takes approximately 4 hours (info obtained from the operator's Head of Security).
- [28] Info obtained from the operator's preferred supplier.
- [29] Idem.
- [30] Info obtained from the operator's Surveillance department and from the operator's preferred supplier.
- [31] Again, responses have been plotted on a (five-point Likert) scale, tested by means of an exploratory factor analysis, and verified for internal consistency.
- [32] See Appendix 1 for more details on the properties of the scale.
- [33] Over the past decade there have been valuable contributions in criminological literature on how to measure displacement effects of crime reduction activities (see e.g. Bowers and Johnson 2003).
- [34] Displacement to process steps other than the pick-up and delivery process (e.g. offenders turning their attention to depot locations as a result of enhancing security in the transport process) has not been considered in this exercise.
- [35] Statements are translated from the original (Dutch) questionnaire. Meanings can be slightly shifted due to this operation.

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APPENDIX 1: DRIVER SURVEY RESULTS³⁵

a. Awareness scale

<u>Used items</u>	<u>Factor loading</u>	<u>Cronbach's Alfa</u>
<i>5 point scale ('fully agree' to 'fully disagree')</i>		0,627
"I think there is a great chance that a person with bad intentions will try to access my vehicle".	0,679	
"I think a lot can be done to prevent access to my vehicle".	0,590	
"I think the damage to the company caused by theft is big".	0,567	
"I think my colleagues don't lock their vehicles appropriately".	0,364	

b. Commitment scale

<u>Used items</u>	<u>Factor loading</u>	<u>Cronbach's Alfa</u>
<i>5 point scale ('fully agree' to 'fully disagree')</i>		0,550
"I don't think I should engage myself in trying to prevent unauthorized to my vehicle during working hours". (R)	0,630	
"I would like to assist with the prevention of unauthorized access to my vehicle".	0,534	
"A driver is the ideal person to prevent unauthorized access to the vehicle".	0,486	

c. Belief scale

Belief	Factor loading								
<i>5 point scale ('fully agree' to 'fully disagree')</i>	Key card	Audible alarm	Silent alarm+ GPS	Formal instructions	Awareness training	Double drivers	Overt security escorts	No company logos	Notification on vehicles
“I believe others would be deterred to enter my vehicle with this measure”.	0,843	0,796	0,529	0,717	0,757	0,528	0,455	0,843	0,870
“This measure makes it more difficult for others to enter my vehicle”.	0,759	0,929	0,876	0,807	0,983	0,630	0,567	0,802	0,682
“I think this is a useless measure”. (R)	0,561	0,674	0,838	0,833	0,814	0,792	0,858	0,811	0,834
“I think this measure would <u>not</u> have an effect on the number of successful attempts to enter the vehicle”. (R)	0,557	0,350	0,707	0,825	0,722	0,548	0,560	0,349	0,862
“One cannot fully secure a vehicle against intruders without the use of this measure”.	0,498	0,832	0,506	0,585	0,487	0,746	0,587	0,895	0,809
<i>Cronbach's Alfa</i>	0,738	0,798	0,821	0,866	0,867	0,744	0,711	0,856	0,902

d. Practicability scale

<u>Practicability</u>	<u>Factor loading</u>								
<i>5 point scale ('fully agree' to 'fully disagree')</i>	Key card	Audible alarm	Silent alarm+ GPS	Formal instructions	Awareness training	Double drivers	Overt security escorts	No company logos	Notification on vehicles
"I would get used to this measure after a few hours".	0,911	0,665	0,448	0,763	0,756	0,882	0,898	0,742	0,757
"My job could go much easier thanks to this measure".	0,819	0,847	0,810	0,965	0,843	0,657	0,571	0,640	0,593
"I will need more time to finish my round with this measure". (R)	0,750	0,958	0,881	0,541	0,445	0,786	0,300	0,835	0,730
"I would be hindered in my job if this measure would be used". (R)	0,689	0,772	0,844	0,702	0,729	0,766	0,610	0,682	0,782
<i>Cronbach's Alfa</i>	0,847	0,883	0,828	0,820	0,773	0,872	0,646	0,815	0,751

e. Social cost

Social cost	Factor loading								
<i>5 point scale ('fully agree' to 'fully disagree')</i>	Key card	Audible alarm	Silent alarm+ GPS	Formal instructions	Awareness training	Double drivers	Overt security escorts	No company logos	Notification on vehicles
"I would feel less free in my job if this was applied".	0,954	0,947	0,981	0,958	0,936	0,801	0,807	0,963	0,934
"This measure would not even be necessary if the company has enough confidence in the honesty of their drivers".	0,808	0,803	0,577	0,818	0,728	0,502	0,630	0,634	0,549
"I would feel invaded in my privacy by this measure".	0,777	0,856	0,907	0,934	0,743	0,713	0,746	0,864	0,656
"With this measure every driver is treated equally". (R)	0,751	0,736	0,655	0,709	0,742	0,520	0,451	0,801	0,899
"I would feel aimed at if this measure was applied".	0,605	0,613	0,733	0,696	0,527	0,813	0,613	0,976	0,895
<i>Cronbach's Alfa</i>	0,877	0,884	0,880	0,912	0,846	0,780	0,784	0,927	0,886

CHAPTER 4: CONCLUSIONS

This fourth and final chapter summarizes the outcome of the previous chapters, providing an answer to the research questions that were set forth in the introductory part of this manuscript. Based on the overall outcome we feel confident to state that our initial hypothesis is a valid one: a thorough and “ex ante” consideration of the measures that are deemed (or claimed) effective to tackle a certain crime problem or risk, avoids that time and resources would be wasted, and negative side effects would come into effect once a measure is introduced. It further contributes to the overall effectiveness of the intervention, as key considerations such as an assessment of user belief and user commitment - to name but a few - influence the quality of its outcome.

The main contributions of this doctoral study are (1) the identification of (the need for) an ex ante consideration of alternative measures as a key activity in any situational program design and (2) the definition of the preconditions, costs and reverse effects that need to be assessed as part of this consideration. We feel confident that both findings will contribute to the existing body of knowledge on situational crime prevention, and to a more effective and efficient application of situational techniques in a real life environment.

This closing chapter summarizes the main findings of the study and further clarifies at what stage in a generic program design the ex ante consideration of alternative measures ideally takes place. For clarity reasons, each section in this chapter is preceded by a quote of the relevant research question(s). This chapter further includes some recommendations for future programming, recommendations that are based on the outcome of the study but not form part of its scope.

1. Setting the scene

This doctoral study started off from the observation that, over the past decade, operators in the international supply chain have increasingly been confronted with the introduction of programs to secure supply chains against acts of unlawful interference. Some of these programs are mandatory, other are industry driven. The majority of them are quite

prescriptive and detailed, and most of them contain the requirement to implement a range of very specific measures and controls.

In most (if not all) programs, these measures and controls can be classified as situational measures. This has been illustrated by means of a thorough analysis of two initiatives: the EU Air Cargo Security Program and the TAPA (2007) Freight Security Requirements (see also Annex 1). As indicated in the introduction, the research reported on in this manuscript does not cover the effectiveness of the measures that are put forward by policy makers, nor an evaluation of one (or more) particular program(s). The main objective of the research is to contribute to a better understanding of the selection process of alternative measures that are deemed effective to tackle a certain (crime) problem, focussing on the cost of these measures and on the conditions that need to be in place in order for their introduction to be successful.

2. Implementation problems reported by end-users

<u>Research question(s):</u>

What implementation problems are reported by end-users in the supply chain?

As part of a targeted study conducted on behalf of the Directorate-General Transport and Energy of the European Commission⁴⁰, end-users of the European Air Cargo Security Program and the TAPA (2007) Freight Security Requirements have been asked to report on any implementation problems they encountered when implementing the various controls in their operations (see also Annex 2 for full detail). These problems have been analysed and categorized based on their common denominators. The findings derived from this exercise, together with the outcome of an initial literature review, were consolidated into a set of ‘success indicators’ (see Table 1).⁴¹

⁴⁰ COUNTERACT - Cluster of User Networks in Transport and Energy Relating to Anti-terrorist Activities, 2006–2009.

⁴¹ Based on this exercise it was further argued that the effectiveness and/or efficiency of a measure often depend on the availability of other measures. Whenever interdependencies are identified, these should obviously be accounted for.

Table 1: Success indicators

Indicator	Reported problems (some examples)
1. Availability	<ul style="list-style-type: none"> - Limitations to check previous employment or criminal history due to privacy legislation - Limited abilities to verify information across borders - Lack of access to information sources to conduct staff vetting
2. Required level of knowledge, expertise and guidance	<ul style="list-style-type: none"> - Expertise required to check the identity of persons delivering known freight - Expertise required to verify cargo documentation - Expertise required to screen consignments for prohibited articles
3. Practicability	<ul style="list-style-type: none"> - Difficulties encountered with organizing security awareness training for all relevant categories of staff - Inability to seal multiple stop pick-up and delivery vehicles - Difficulties encountered with limiting the use of soft-sided trailers during peak season
4. Financial / economic cost	<ul style="list-style-type: none"> - Cost of screening equipment - Cost of providing security awareness training - Cost of staff vetting - Cost of protecting building walls, roofs and doors - Cost of providing full CCTV-coverage for warehouse and dock areas
5. Ethical / social cost	<ul style="list-style-type: none"> - Privacy issues related to staff vetting - Privacy issues related to controlling access to facilities - Privacy issues related to conducting identity checks on individuals
6. Ease of circumvention	
7. Beneficial side effects	
8. Reverse effects	<ul style="list-style-type: none"> - Escalation of violence when using overt or covert escorts to secure transport movements
9. Stakeholder / user belief	<ul style="list-style-type: none"> - Limited belief in the effectiveness of documentation requirements
10. Stakeholder / user awareness and commitment	

3. Re-thinking the cost of supply chain security

Research question(s):

How do these (implementation problems) relate to what we already know from academic literature on situational crime prevention?

How can costs and implementation problems best be classified?

What should fall within the scope of an ex ante consideration of preventive measures?

Following a second, more thorough literature review and consequent analysis, the indicators that had initially been identified, have been re-classified. One of the initial indicators (i.e. ‘beneficial side effects’) was abandoned because it relates to the ‘benefit’ side of the cost-benefit equation. Another indicator (i.e. ‘ease of circumvention’) has been captured under a different heading. The final classification distinguishes between a set of generic preconditions; the (financial, ethical and esthetical) costs of a specific measure that is under consideration; and the impact of a range of unintended consequences that may come into effect following its introduction (see also Table 2).

Table 2: Preconditions, costs and reverse effects (Source: Haelterman 2011: 397)

Pre-conditions (general)	Costs (specific)	Reverse effects (specific)
Availability	Financial / monetary cost	Displacement
Practicability	- Fixed	- Geographical
Required knowledge	- Variable	- Temporal
Required expertise		
User awareness	Ethical / social cost	- Target
User belief	- Labelling / discrimination	- Tactical
User commitment	- Distrust	- Crime type
Co-operation	- Civil liberties	
	- Inequalities	Escalating effects
		Creative adaptation
	Esthetical cost	Enticement effects

It is argued that a measure should only be introduced after having identified and considered all available alternatives, and that this (ex ante) consideration should include the assessment of :

- Certain *preconditions* that need to be in place in order for any intervention to be effective. This is the case for the practicability and availability of a measure to end-users, as well as for the knowledge and expertise that is required to evaluate and implement it. Furthermore, end-users need to be aware of the problem that is being dealt with; they need to belief in the effectiveness of the proposed solution(s); and they need to be committed to solve the problem and to co-operate with other stakeholders to reach the desired outcome. If these preconditions are not or insufficiently met, the effectiveness and efficiency of the proposed solution may be severely compromised.
- A first set of *cost components* that specifically relate to the introduction of a certain measure that is under consideration. This is the case for its financial, ethical and esthetical costs. As argued before, monetary costs cover the fixed and variable costs of investing in crime prevention. Ethical costs relate to the (perceived) impact of the introduction of a measure on civil liberties, convenience and conduct of staff, customers and other stakeholders; and esthetical costs relate to the (perceived) impact on the esthetics of the environment in which a measure is introduced.
- The impact of a range of *unintended consequences* that may come into effect following the introduction of a certain (set of) measure(s). As outlined in Table 2, this impact may result from displacement⁴², escalating, creative adaptation and/or enticement effects.

⁴² As argued by Bowers and Johnson (2003: 276), research indicates that crime displacement is not a necessary outcome of crime prevention activity, and it is also possible that crime reduction schemes may have a diffusion of benefits. Furthermore, it has been argued that even where displacement occurs, there may be some benefit to this (e.g. offenders choosing to commit less serious types of crimes than those prevented). A systematic review of 102 evaluations of situational crime prevention initiatives by Guerette and Bowers (2009) further supports the view that crime does not necessarily relocate in the aftermath of situational interventions, as does a review article recently published by Weisburd and Telep (2012).

4. An ex ante consideration of alternative measures as part of a generic (situational) program design

<u>Research question(s):</u>

When should an ex ante consideration of preventive measures ideally take place?

Having identified the various items that require careful consideration, the question remains *when* this consideration should take place. In this section it is argued that an ex ante consideration of preventive measures ideally forms part of the generic program design, and should be regarded as a separate stage in the design process.

Clarke (1997: 15) describes the standard methodology that is applied for situational projects as ‘a version of the action research model in which researchers and practitioners work together to analyse and define the problem, to identify and try out possible solutions, to evaluate the result and, if necessary, to repeat the cycle until success is achieved’. As such a generic situational crime prevention project comprises five stages: (1) the collection of data about the nature and dimensions of the specific crime problem; (2) the analysis of the situational conditions that permit or facilitate the commission of the crimes in question; (3) a systematic study of possible means of blocking opportunities for these particular crimes; (4) the implementation of the most promising, feasible and economic measures; and (5) the monitoring of results and dissemination of experience.

According to Tilley (2005: 8) ‘the commonsense problem-solving approach to crime issues suggests that we first scan the environment for existing and future problems, then subject them to careful analysis to figure out what might be done about them, and on the basis of this develop a strategy to address them, which is then systematically evaluated so that practice may be refined and failed approaches abandoned’. The same problem-solving methodology is used in problem-oriented policing and in many other forms of social intervention (Clarke, 1997: 15). ‘Problem-oriented policing’, first introduced in 1979 and captured in the four-stage SARA model (i.e. Scanning, Analysis, Response and Assessment), reflects the same action research paradigm underpinning situational crime prevention. According to Goldstein (1979; Clarke and Eck, 2003: 5-1; Scott et al., 2008: 225) achieving greater operational effectiveness for the police requires: (1) identifying the

everyday problems they handle in more precise terms; (2) researching each problem; (3) documenting the nature of the current police response to these problems; (4) assessing its adequacy and the adequacy of existing authority and resources; (5) engaging in a broad exploration of alternatives to present responses; (6) weighing the merits of these alternatives; and (7) choosing from among them.

The SARA model was originally developed by Eck and Spelman as a simple problem-solving tool that can help in addressing any crime or disorder problem (Morgan and Cornish, 2006: 29). More recently Ekblom (cited in Clarke and Eck, 2003: 8-2) developed the SARA-acronym further into what he refers to as ‘the 5 I’s’: (1) intelligence (i.e. ‘gathering and analysing information on crime problems and their consequences, and diagnosing their causes’); (2) intervention (i.e. ‘considering the full range of possible interventions that could be applied to block, disrupt or weaken those causes and manipulate the risk and protective factors’); (3) implementation (i.e. ‘converting potential interventions into practical methods, putting them into effect in ways that are appropriate for the local context, and monitoring the actions undertaken’); (4) involvement (i.e. ‘mobilising other agencies, companies and individuals to play their part in implementing the intervention’); and (5) impact and process evaluation (i.e. ‘assessment, feedback and adjustment’).

If we review the above stages and incorporate the outcome of this doctoral study⁴³, we end up with a dynamic approach that consists of six (opposite to five) ‘consecutive’ stages :

- (1) Phase one (i.e. the *identification and definition* of the problem and relevant stakeholders) is by far one of the most important although often underestimated stages in the process. If the problem definition is wrong to start with or important information is overlooked, then the whole crime reduction process can be compromised (Laycock, 2005: 682). First of all it is important to collect as much data as possible on the nature of the (crime) risk or problem, its extent and (possible) impact. Ekblom (1988, in: Gilling, 1996: 12) identifies this stage as ‘obtaining data on crime problems’. Berry and Carter (1992, in: Gilling, 1996: 12) refer to the need for ‘a clear understanding of the problem being addressed’. As

⁴³ See stage four.

Gilling (1996: 19) argues, ‘misdiagnoses of crime problems can result from the failure to research the characteristics of crimes in sufficient depth, although this is not always possible given the limitations of data collection in the crime field’. In any case a clear definition of the problem (or future problem) on hand is essential in order to make a statement on the urge and priority to tackle it. To do so it is also extremely important to identify all relevant stakeholders.

- (2) Once the problem has been identified and defined, it is essential to *analyse* the situational conditions that permit or facilitate the commission of the crimes under study. In this stage of the process the situational contexts and ‘communities’ in which different types of crime are committed and preventive action is required, need to be analysed thoroughly and separately (Mayhew, Clarke, Sturman and Hough, 1976: 29; Hirschfield, 2005: 632).
- (3) As part of stage three an *inventory of potential measures* (whether the most appropriate or not) is to be produced⁴⁴. According to Clarke (1997: 4) ‘situational measures must be tailored to highly specific categories of crime, which means that distinctions must be made, not between broad categories such as burglary and robbery, but rather between the different kinds of offences falling under each of these categories’. ‘For maximum effect, every specific kind of crime, including each variety of terrorism, requires its own analysis and its own tailor-made solutions [...] and usually a package of measures must be introduced’ (Clarke, 2006: xi-xii). The outcome of this stage should be a list of potential solutions that are considered effective to tackle the problem.
- (4) In order to stress the importance of an *ex ante consideration of potential measures* we believe it is essential to identify this consideration as a separate, individual stage in any program design. All too often countermeasures that are thought of to be effective are identified and implemented without considering any potential side effects or interdependencies. These side effects and interdependencies (if any) will eventually come to the surface after the measures have been implemented (e.g. as part of the monitoring or evaluation phase), resulting in the need for abandoning

⁴⁴ Alternative options to risk reduction may be to avoid, accept or transfer the risk.

initial approaches, the need for adjustments or ‘damage repair’ or, even worse, resulting in the conclusion that measures are totally ineffective and efforts and resources have been completely wasted. The need for an ‘ex ante’ assessment of preventive measures has been touched on in literature but had never been explored in full detail. As such we feel confident that the outcome of this study clearly contributes to the body of knowledge on (and application of) situational crime prevention.

- (5) The actual *implementation* stage starts once all potential measures have been identified and considered and a detailed implementation plan allowing for constant monitoring and an ‘ex post’ impact and process evaluation has been agreed upon with all stakeholders and program partners.
- (6) The general purpose of *evaluation* is to provide feedback that will generate corrections to and refinements in crime prevention theory, policy and practice (Tilley, 2002: 1). Scientific evaluations are necessary in order to measure and establish the effects of a program. As such they are said to be part of the remedy for exaggeration and overgeneralization of its efficacy (Eck, 2002: 95). According to the National Crime Prevention institute, ‘a thorough evaluation can help to (1) measure the degree of progress toward the general goal of reducing crime, (2) identify weak and strong points of program operations and suggest changes, (3) compare efficiency and effectiveness of existing program activities with other possible program activities, (4) challenge underlying program assumptions and improve the quality of program objectives, (5) suggest new procedures and approaches, (6) provide for timely recognition of negative program effects, (7) help establish priorities for resource allocation, (8) increase public support for successful approaches and reduce emphasis on unsuccessful approaches, (9) provide standards against which to measure achievement and (10) develop a critical attitude among (program) staff and advisory personnel, and increase communication and coordination among them (NCPI, 2001: 184). Four basic elements must be considered in all evaluations: interventions (i.e. the package of actions whose effectiveness the evaluation is supposed to determine), outcomes (i.e. the changes in target crimes or disorders), cases (i.e. the people or areas

involved with crime) and settings (Shadish et al., in: Eck, 2005: 702). In most cases evaluations take place once the program has been implemented and settled for a certain period of time. It is important, however, to receive the feedback as soon as possible in order to allow for fine-tuning and, if necessary, more encompassing adjustments. A built-in monitoring system provides for these functions and can further be used for purposes of program evaluation (Gilling, 1996: 11).

As Clarke and Eck argue, the above stages shouldn't necessarily follow one another in a strictly linear fashion. An unfolding analysis can result in refocusing of the project, and questions about possible responses can lead to the need for fresh analyses. The longer and more complicated the project, the more iterations of this kind are likely to occur (Clarke and Eck, 2003: 8-1). One requirement that is consistent throughout the process is the need for proper analysis. Analyses can be undertaken at each stage of the cycle: analyses in the initial stages would focus on crime problems and the socio-environmental contexts in which they occur, while analyses in later stages would be concerned with the measurement of policy impacts, the attribution of observed changes to interventions and the search for any policy side-effects such as displacement, crime switch or the diffusion of benefits (Hirschfield, 2005: 632). Obviously any proper analysis requires the availability of (accurate) data. In practice data on crime problems are often hard to access, partial and inaccurate, and identifying patterns and underlying problems requires substantial understanding and skills (Tilley, 2005: 8). As Tilley continues, 'the initially "obvious" can be quite mistaken, and ill-thought through but well intentioned responses are capable of producing perverse and damaging effects'.

Various tools are available to support this process of data gathering and analysis: impact analyses, vulnerability scans, crime-centred analyses (CCA)⁴⁵, crime-environment analyses (CEA)⁴⁶, crime script analyses⁴⁷, etc.

⁴⁵ Crime-centred analysis (CCA) uses a range of measurements and statistical techniques to identify the manifestation of crime and how it is changing over time, and includes analyses of its spatial distribution, its temporal patterns and how crime within one area compares with that elsewhere (Hirschfield, 2005: 637).

⁴⁶ Crime-environment analysis (CEA) examines the relationship between crime and aspects of the physical and social environment. It includes exploring links between crime and community-level characteristics (e.g. disadvantage, community cohesion) and between crime and other factors such as landuse, transport routes, the distribution of crime generators, crime attractors and, if available, crime prevention measures (Hirschfield, 2005: 637).

5. Recommendations for future programming

Research question(s):

What can we learn from the outcome of this study to guide future programming?

A preliminary analysis of a range of supply chain security programs and a survey conducted amongst end-users of these programs indicate (1) an obvious preference of policy makers for the introduction of situational controls and (2) a series of unexpected costs and implementation problems reported on by field practitioners. In this dissertation it is argued that an ex ante consideration of alternative solutions can assist in mitigating these problems and, as such, contribute to the overall effectiveness of a (situational) program.

In order to enable operators in the supply chain to select the most promising measures that best fit the setting in which they are to be introduced, they must obviously be allowed a certain *freedom of choice* between a number of alternative solutions, or the freedom to come up with alternatives that are equivalent to those proposed by policy makers. This is currently the case in some but by far not all programs. As where customs supply chain security programs such as the European Authorized Economic Operator Program basically indicate the scope and objectives of the required intervention – i.e. highlighting the risk but leaving the decision on what particular safeguards best to introduce open to end-users (or at least to some extent)⁴⁸ - business driven initiatives such as the TAPA Freight Security Requirements only list a range of very specific situational measures that need to be introduced in order to reach and maintain compliance. The latter program allows only

⁴⁷ Crime scripts describe the ways in which an offence unfolds and attempt to make explicit the series of decision points through which the would-be offender passes in the process of crime commission. They treat crimes as stories involving a cast of characters, props and locations that unfold in a purposeful sequence of stages, scenes and actions (Morgan and Cornish, 2006: 13). As Laycock argues, crime scripts can be useful in the response development process since they offer a mechanism for systematically working through the decision process, thus exposing a range of potential intervention points (Laycock, 2005: 682).

⁴⁸ The AEO Guidelines ensure a harmonized implementation of the AEO rules throughout the EU, guaranteeing the equal treatment of economic operators and transparency of the rules. Part one of the AEO guidelines explains the AEO concept based on the adopted legislation, while part two contains the questionnaire, providing a list of points to assist both customs authorities and AEO applicants in assessing whether or not the AEO criteria are met. For a full overview of these guidelines: http://ec.europa.eu/taxation_customs/resources/documents/customs/policy_issues/customs_security/aeo_guidelines_en.pdf, (accessed 23 December 2011).

very limited space for considering whether the proposed measure best suits the environment in which it is to be introduced.

As indicated in the introduction, the analysis of a number of supply chain security programs revealed that although Clarke's classification of techniques comprises five different strategies, there appears to be an over-representation of two particular strategies (Haelterman, 2009a: 36). Allowing scope for choice between alternative measures may widen the potential of situational crime prevention in the international supply chain and increase the number of professionals occupied with developing, implementing and evaluating new techniques, leading to innovative approaches and a continuous refinement of existing ones. Furthermore, allowing sufficient freedom to make a choice between a range of alternative measures is not only recommended based on the arguments that have been raised in this manuscript, but is also key to situational crime prevention as a concept. According to Clarke (1997: 4), "situational crime prevention comprises opportunity-reducing measures that (1) are directed at highly specific forms of crime, (2) involve the management, design or manipulation of the immediate environment in as systematic and permanent way as possible, (3) make crime more difficult and risky, or less rewarding and excusable as judged by a wide range of offenders". Every specific environment in which a measure is to be introduced, will have its own features that need to be considered when deciding on the best option. As such, defining one particular measure as being the best option for implementation in a global environment encompassing thousands of business settings may appear to be a bit overambitious.

As to guide future programming, it is recommended that those responsible for the development, direction, enforcement and evaluation of existing or future programs take the above into consideration when imposing new or revised requirements upon end-users. It is recommended that the emphasis of policy makers is being put on defining the key objectives of the program and on meeting these objectives in the most effective and efficient way, clearly stating what risks need to be tackled without being too prescriptive or limitative in defining the 'how'.

This proposed shift to a more lenient and partnership approach does not come without a challenge. In this dissertation it is indicated that (situational) crime prevention is a very

complex endeavor, requiring specific theoretical understanding and skills, and the availability of accurate data. End-users will need to have sufficient knowledge and expertise to select the most efficient solution from a range of alternatives, and those tasked with verifying compliance to the program (i.e. governments officials or commercial certification bodies) will need to be capable of assessing whether or not the controls that have been obtained for by a particular user, meet the key objectives of the program. As these activities require a certain level of expertise that may not be readily available to date, it is recommended that government and academia offer additional guidance and support, e.g. by familiarizing practitioners with key concepts and techniques, by funding or conducting additional research and evaluation studies, by means of collecting and disseminating relevant (incident) data and research findings, and by facilitating best practice sharing. The recent call for proposals published by the European Commission on creating a virtual network of excellence on security research⁴⁹ is a good example of what can be done to improve current and support future practice.

⁴⁹ Topic SEC-2012.7.4-2 : Networking of researchers for a high level multiorganisational and cross-border collaboration, http://ec.europa.eu/research/rea/pdf/sec_info_day_2011/2_fp7-sec-2012-1_call_en.pdf, accessed 20 January 2012.

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ANNEX 1: SITUATIONAL CRIME PREVENTION AND SUPPLY CHAIN SECURITY

In this annex it is illustrated that the security measures defined in the EU (NL) Air Cargo Security Program⁵⁰ and in the TAPA (2007) Freight Security Requirements⁵¹ can all be classified as situational measures using the 25-category classification of opportunity-reducing techniques provided for by Clarke and his colleagues (see Table 1). Each measure is listed against the situational strategy it best represents: ‘increasing the perceived effort’, ‘increasing the perceived risk’, ‘reducing the rewards’, ‘reducing provocations’, or ‘removing excuses’. Various measures can be classified under more than one strategy, and are listed accordingly.⁵²

Table 1: Situational Crime Prevention Techniques (source: Clarke, 2005: 46-47)

Increase the effort	Increase the risk	Reduce the rewards	Reduce provocations	Remove excuses
<i>1. Harden targets</i> (e.g. immobilisers in cars, anti-robbery screens)	<i>6. Extend guardianship</i> (e.g. cocooning, neighbourhood watch)	<i>11. Conceal targets</i> (e.g. gender-neutral phone directories, off-street parking)	<i>16. Reduce frustration and stress</i> (e.g. efficient queuing, soothing lighting)	<i>21. Set rules</i> (e.g. rental agreements, hotel registration)
<i>2. Control access to facilities</i> (e.g. entry phones, alley-gating)	<i>7. Assist natural surveillance</i> (e.g. improved street lighting, neighbourhood watch hotlines)	<i>12. Remove targets</i> (e.g. removable car radios, pre-paid public phone cards)	<i>17. Avoid disputes</i> (e.g. fixed cab fares, reduce crowding in pubs)	<i>22. Post instructions</i> (e.g. ‘no parking’, ‘private property’)
<i>3. Screen exits</i> (e.g. electronic tags for libraries, tickets needed)	<i>8. Reduce anonymity</i> (e.g. taxi driver ID’s, ‘how’s my driving?’ signs)	<i>13. Identify property</i> (e.g. property marking, vehicle licensing)	<i>18. Reduce emotional arousal</i> (e.g. controls on violent porn, prohibit paedophiles working with children)	<i>23. Alert conscience</i> (e.g. roadside speed display signs, ‘shoplifting is stealing’)
<i>4. Deflect offenders</i> (e.g. street closures in red light district, separate toilets for women)	<i>9. Utilise place managers</i> (e.g. train employees to prevent crime, support whistle blowers)	<i>14. Disrupt markets</i> (e.g. checks on pawn brokers, licensed street vendors)	<i>19. Neutralise peer pressure</i> (e.g. ‘idiots drink and drive’, ‘it’s ok to say no’)	<i>24. Assist compliance</i> (e.g. litter bins, public lavatories)

⁵⁰ Dutch National Civil Aviation Security Program (version February 2005 - restricted).

⁵¹ TAPA (2007) Freight Security Requirements:

http://tapaemea.com/download/public_fsr/2007_TAPA_A_FSR_Audit_Form.pdf, accessed 28 December 2007.

⁵² There is a considerable overlap between the various techniques and it is obvious that preventive measures can serve more than one purpose cq. represent more than one strategy.

<p><i>5. Control tools / weapons</i></p> <p>(e.g. toughened beer glasses, photos on credit cards)</p>	<p><i>10. Strengthen formal surveillance</i></p> <p>(e.g. speed cameras, CCTV in town centres)</p>	<p><i>15. Deny benefits</i></p> <p>(e.g. ink merchandise tags, graffiti cleaning)</p>	<p><i>20. Discourage imitation</i></p> <p>(e.g. rapid vandalism repair, V-chips in TV's)</p>	<p><i>25. Control drugs / alcohol</i></p> <p>(e.g. breathalysers in pubs, alcohol-free event)</p>
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1. EU (NL) Air Cargo Security Regulations

1.1. Requirements for Regulated Agents

Situational strategy	Security measure
Increase the effort	<ul style="list-style-type: none"> - Access control to premises and designated areas in order to ensure that air cargo is secured from unauthorised interference - Proper packaging/sealing of consignments of air cargo - Protection of known freight against unauthorised interference at all times - Protection of consignments against unauthorised interference during transport - Locking of vehicles - Sealing of vehicles
Increase the risk	<ul style="list-style-type: none"> - Nomination of at least one person (per site) responsible for the application and control of the relevant security measures - Adequate verification of accompanying documentation - Adequate verification of packaging and/or sealing - Identity check on persons delivering known freight - Reporting of irregularities to appropriate nominee and authorities
Increase the effort / increase the risk	<ul style="list-style-type: none"> - Staff vetting - Screening of consignments for prohibited articles - Proper documentation of air cargo
Increase the risk / remove excuses	<ul style="list-style-type: none"> - (Awareness) training of all relevant categories of staff

1.2. Requirements for Known Consignors⁵³

Situational strategy	Security measure
Increase the effort	<ul style="list-style-type: none">- Preparation of consignments of air cargo in secure areas- Protection of consignments of air cargo against unauthorised interference during preparation, storage and/or transport
Increase the effort / increase the risk	<ul style="list-style-type: none">- Preparation of consignments of air cargo by reliable staff- Proper documentation of consignments of air cargo (i.e. content, weight, number of pieces, consignee)
Remove excuses	<ul style="list-style-type: none">- Declare in writing that consignments of air cargo do not contain any prohibited articles unless properly declared

1.3. Requirements for Road Hauliers⁵⁴

Situational strategy	Security measure
Increase the effort	<ul style="list-style-type: none">- Protection of consignments against unauthorised interference during transport- Cargo compartments locked / sealed
Increase the risk	<ul style="list-style-type: none">- Nomination of at least one person responsible for the application and control of the security measures- Verification of locks and seals when vehicle was left unattended- Only pre-planned stops- Immediate reporting of irregularities to Principal
Increase the effort / increase the risk	<ul style="list-style-type: none">- Staff vetting (criminal history check, reference check)
Increase the risk / remove excuses	<ul style="list-style-type: none">- Awareness training of all staff with access to air cargo

⁵³ Dutch National format Known Consignor Declaration.

⁵⁴ Dutch regulation – Official Journal (‘Staatscourant’) 29 December 2006, nr. 253.

Remove excuses	- Subcontracting not allowed without agreement in writing from Principal
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1.4. Requirements for Account Consignors⁵⁵

Situational strategy	Security measure
Increase the effort	<ul style="list-style-type: none"> - Access control to areas where consignments of air cargo are prepared, packaged and/or stored to ensure no unauthorised persons have access to the consignments - Protection of consignments of air cargo against unauthorised interference - Adequate packaging (tamper evident closure where possible) of consignments of air cargo - Protection of consignments against unauthorised interference during transport
Increase the risk	<ul style="list-style-type: none"> - Nomination of at least one person responsible for the application and control of the National instructions - Reporting of (apparent or suspected) irregularities to the responsible nominee - Responsible nominee to take appropriate action
Increase the effort / increase the risk	<ul style="list-style-type: none"> - Visitor escorts at all times in areas where consignments of air cargo are prepared, packaged and/or stored - Staff vetting - Screening of consignments for prohibited articles - Proper documenting of consignment of air cargo
Increase the risk / remove excuses	<ul style="list-style-type: none"> - Awareness training of all staff with access to air cargo

⁵⁵ Dutch National instructions on security of premises, staff and transport for Account Consignors (version 2007).

2. TAPA (2007) Freight Security Requirements (A-class)

Situational strategy	Security measure
Increase the effort	<ul style="list-style-type: none">- Any windows or other openings in warehouse walls and roof secured- Ground floor warehouse windows protected by anti-ram posts or other physical barriers- Dock doors of sufficient strength or design to prevent or delay forced entry by use of portable hand tools or ramming by vehicle- Reinforced exit doors from warehouse (steel doors and frames or suitable alternative)- Exterior walls designed to resist penetration by removing building fabric, cutting or ramming by vehicle- Visitor office access points controlled- All office access points controlled- Access control processes both during and outside normal operating hours to ensure access is granted only for authorized Supplier employees and visitors- Only Suppliers authorized employees and escorted visitors permitted access to dock/warehouse- Restricted-access, caged/vault area for assets on site more than 2 hours: high-grade security mesh, chain-link, or hard wall, including top/roof; alarmed, CCTV, controlled access- All external dock and warehouse doors closed and locked unless required to be opened for normal transit operations- Restricted access to alarm system- Restricted access to CCTV system functions- Restricted access to system functions- Procedures in place to restrict Supplier's employees, visitors and contractors access to Buyer's assets- Adequate control of paperwork. Restricting knowledge of transit of Buyer's assets to "need to know" only (Information Security)- Personal containers (defined as lunch box, backpacks, coolers, purses, etc.) are controlled in the warehouse- Personal vehicles access to shipping and receiving yard controlled- Solid top, hard-sided, locked cargo doors or reinforced soft sided trailers- Security tamper evident seals for trucks carrying Buyer only shipments- Vehicle immobilizing device in place

Increase the risk

- CCTV external coverage of shipping and receiving yard, including entry / exit points, to cover movement of vehicles and individuals
 - CCTV coverage of all external dock area
 - CCTV system able to view all exterior sides of the facility
 - Flood lighting of enclosed loading / unloading areas
 - Dock doors illuminated externally at night
 - External and internal lighting levels that support high quality CCTV images and recording
 - All facility external doors alarmed and linked to main alarm system
 - Internal docks covered by CCTV
 - Buyer designated assets under 100% CCTV surveillance while in Supplier Facility (this does not require 100% of floor coverage, rather 100% coverage of Buyer Assets e.g. CCTV from dock to pallet breakdown and build area, to HVP cage)
 - Motion detection alarms inside warehouse and activated when entire facility is vacated (N/A if facility is true 24x7x366 operation)
 - All security system alarms responded to in real-time 24x7x366
 - Minimum of 60 day records on system alarms
 - Alarms monitored
 - All CCTV images are recorded in real time (VCR or digital-recording system). Real-time recording: minimum 1,25 frames per second per camera
 - Preventative maintenance plan in place for CCTV systems (can be contracted or in house)
 - Minimum 60 day records on system transactions
 - Local documented procedures for handling Buyer's assets and escalation procedures for communicating security incidents to Buyer
 - Process for timely reporting of lost, missing or theft of Buyer's assets. Incidents to be reported by the Supplier to the Buyer within 12 hours; obvious thefts reported immediately
 - Emergency customer and local management contacts for security incidents listed and available
 - Employee and contractor company photo-ID badges issued and worn
 - Badge Policy for visitors/contractors in place
 - Random trash inspection procedures in place for trash removal from dock/warehouse
 - Security incident reporting system and method of tracking local security incidents
 - Procedure in place to verify box and pallet integrity
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	<p>upon receipt</p> <ul style="list-style-type: none"> - Two-way voice communication system between vehicle cab, Supplier's base (and escorts, if applicable) and procedures for reporting - Written contingency plans in place for reporting unscheduled events (i.e. stops, delays, route deviation) - Routes, schedules and planned stops assessed for risks and reviewed - Policy in place requiring driver to be present for loading and unloading when allowed - Pre-alert capability in place - Destination to notify origin within 4 hours of receipt of shipment, reconciling pre-alert shipment details
Increase the effort / increase the risk	<ul style="list-style-type: none"> - Security controlled access points (e.g. guard, card access or CCTV with intercom) - Manned security monitoring post 24x7x366; monitoring post secure from attack - Minimum 30-day retention of all CCTV recordings; recordings are held in secure storage area - Quarterly review of access reports - Preventative maintenance plan in place to routinely test and service access control and alarm systems - At inbound checkpoint for drivers and crews, identity and authorization are validated by officially issued photo-ID (e.g. Driver's license, passport or national ID card) - Keys controlled in areas where Buyer's assets are transited / stored - Exit Searches performed on exit from secure areas used for Buyer's assets - Criminal history check in place encompassing 5yr criminal history, employment check (vetting within constraints of local country laws) - Termination procedures in place for employees and contractors, ensuring return of ID's, access cards, keys and other sensitive information - Procedure in place to preventing systems access to Buyer's data by terminated employees - Records maintained to consider background of previously terminated personnel before re-hiring - Truck cabins and ignitions keys secured from unauthorized use at all times - Proof of shipping and receiving records (time, date, driver, shipping and receiving personnel, shipment details and quantity) - Capability to provide overt and covert escorts with real time communications with base and local police;

	<ul style="list-style-type: none"> written documentation in place - Documented response procedures and training for escort personnel - GPS or similar technology installed on all vehicles transporting Buyer's assets
Increase the risk / remove excuses	<ul style="list-style-type: none"> - Security awareness training (including robbery response training) for all employees - Supplier to provide robbery response training detailing safe and secure actions to be taken during the event a driver is threatened. Details of training are to be available to the Buyer - Security Awareness training provided to drivers on mitigating risk. Details of training are to be available to buyer
Reduce rewards	<ul style="list-style-type: none"> - Pre-loading or post-delivery storage of Buyer's assets in trailers
Remove excuses	<ul style="list-style-type: none"> - Supplier Security Policy Statement available and communicated to all employees

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ANNEX 2: EXAMPLES OF IMPLEMENTATION PROBLEMS

This annex captures some of the implementation problems that have been identified by end-users in the supply chain. As part of a targeted study on behalf of the European Commission⁵⁶, a self-completion questionnaire was sent to all Regulated Agents listed on the official site of the Dutch Government⁵⁷, as well as to the four major European Express Integrators. The companies were first contacted by phone in order to explain the scope and objectives of the study, and to ask for the contact details of the person responsible for implementing air cargo security measures (in most cases the Aviation Security Advisor). A copy of the questionnaire was then sent by email for completion. Respondents were given an overview of the various measures contained in the program and asked what implementation problems they encountered when implementing them. They were encouraged to list all possible implementation problems they encountered, whether general in nature or specific to their own situation, and to provide as much detail and examples as possible. From the research population (= a total of 261 companies including the four major European Express Integrators), 40 completed and returned the questionnaire, resulting in a response rate of 15,32%.⁵⁸ As such, the following data was obtained from 37 regulated agents listed in the Netherlands, and from 3 major international express integrators (Haelterman, 2009) :

Security requirement	Implementation problems
3.2.1. Access control to premises and designated areas in order to ensure that (air) cargo is secured	<ul style="list-style-type: none">- Some facilities do not easily lend themselves to securing, therefore cost elements in such premises are extensive- Privacy protection issues may arise- The human factor is difficult to manage- Very expensive and not always feasible for SME's- Additional cost as not taken into consideration at initial / design stage of the building- Difficult to organise: open industrial estate with a lot of companies, people passing by, etc.

⁵⁶ COUNTERACT - Cluster of User Networks in Transport and Energy Relating to Anti-terrorist Activities, 2006–2009.

⁵⁷ www.kmarcargoregister.nl.

⁵⁸ End of July 2008, 300 business locations were recorded in the official database of the Dutch Government. Based on the recorded info (i.e. company name), some locations form part of the same legal entity, which brings the total research population for the Regulated Agents back to 257.

3.2.2. Screening of consignments for prohibited articles

- High cost of equipment
- Throughput issues
- Lack of training material (TIP) for non-PAX
- Sometimes difficult due to the nature of the consignment
- Very expensive
- Time consuming
- Slows down the operation
- Adequate controls would be effective, however there is a lack of proper guidance on how to perform the screening
- Slows down the operation and organising screening 'in-house' is extremely expensive (staff, equipment, etc.)
- Ever since the equipment is in place, we face ongoing / daily visits from Customs. We are considered responsible for much more than before. Customs: "as you already have x-ray in place, you could easily look for other items than those targeted by AvSec regulations"

3.2.3. Proper documentation of air cargo

- Has no security value and can only be described as an assisting measure
- Dependent on consignor acceptance and cooperation
- Lack of knowledge from the side of the shipper
- Poses a lot of problems, in most cases created by local government
- Definition problem on who is the consignor from a legal point of view
- Time consuming and thus leading to additional costs
- Administrative burden but feasible

3.2.4. Adequate verification of accompanying documentation

- Has no security value
- Dependent on consignor acceptance and cooperation
- Lack of knowledge from the side of the shipper
- Goods description is often very vague which does not facilitate the verification process
- Operational burden but feasible

3.2.5. Proper packaging / sealing of consignments of air cargo

- If there is a terrorist on the RA premises, using the already existing consignment to carry an IED is unlikely
 - Complicated for implementation due to operational limitations (e.g. sealing ULD's)
 - Additional costs
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3.2.6. Adequate verification of packaging / sealing	<ul style="list-style-type: none"> - Complicated for implementation due to operational limitations - Very complex for consolidated freight (i.e. multi pick-up and delivery)
3.2.7. Protection of known freight against unauthorized interference at all times	<ul style="list-style-type: none"> - Some areas are under airport authorities' control and no authority nor capabilities to implement security there - The human factor is difficult to manage - Leads to additional costs
3.2.8. Staff vetting / (pre-) employment screening	<ul style="list-style-type: none"> - Moderate effect due to limited abilities to check information cross borders - Limitation on criminal and work history in some countries due to privacy laws. EU open borders causing limited capabilities to obtain information - Background check can be difficult to do if not resident in country for the whole 5 years - No access to the necessary information sources, 'VOG' (= Dutch certificate of good conduct) is not sufficient - Cost issues - Better guidance and information is required, there is too much room for interpretation - Leads to additional costs - Administrative burden but feasible
3.2.9. (Awareness) training of all relevant categories of staff	<ul style="list-style-type: none"> - Large turnover in the transportation industry leads to additional costs - Availability of training (frequency) insufficient - Current frequency of refresher training is too high - Planning of training sessions and replacement of employees attending the training is difficult - Direct and indirect cost issues - Training contains too much theory and too little relevant practice - Completely useless, time consuming and costly - Implementation of e-learning difficult due to type of operation and variety of functions that require training (e.g. drivers, warehouse employees, etc.)
3.2.10. Protection of consignments against unauthorized interference during transport	<ul style="list-style-type: none"> - Not effective for (multiple) pick-up and delivery vehicles - Not always possible as we don't know what exactly happens on the road

	<ul style="list-style-type: none"> - Human factor is difficult to manage - Difficult during loading / unloading periods as our driver is often not allowed to be present
3.2.11. Locking of vehicles	<ul style="list-style-type: none"> - Not effective for (multiple) pick-up and delivery vehicles - Routine leads to ease of conduct - Not always possible
3.2.12. Sealing of vehicles	<ul style="list-style-type: none"> - Not effective for (multiple) pick-up and delivery vehicles - Difficult for consolidated freight - Not always possible
3.2.13. Identity check on persons delivering known freight	<ul style="list-style-type: none"> - Requires training and expert knowledge on how to identify fraudulent documentation - Much bureaucracy - Conflicting regulations - Cost issues - Very difficult when the company on whose behalf the freight is being delivered, doesn't issue company badges: difficult to check whether the person delivering freight actually works for that company - People often feel reluctant to ask for the identity of another person / colleague - Requires qualified staff in order to be effective - Because of time pressure often limited to a 'quick scan' instead of a proper check - Administrative burden but feasible

A survey on implementation problems was also conducted amongst users of the TAPA (2007) Freight Security Requirements. A self-completion questionnaire similar to the previous one (but specifically targeting the TAPA FSR) was sent to TAPA EMEA members via the Chairman of the organisation. Despite various reminders, only 7 companies returned a completed questionnaire.

Key issue	Examples of relevant requirements
Quite a number of measures is identified as being (very) expensive to implement (from a purely financial point of view)	<ul style="list-style-type: none"> - Alarm facility external doors and link to the main alarm system - Retain a minimum of 60 day records on system alarms - Install motion detection alarms inside warehouse and activate when the entire facility is vacated - Have a preventative maintenance plan in place to routinely test and service alarm systems - Monitor alarms - Restrict access to alarm systems - Provide 100% CCTV surveillance of Buyers' assets while in the facility of the supplier - Provide CCTV coverage of all external dock area - Provide CCTV external coverage of shipping and receiving yard, including entry/exit points, to cover movement of vehicles and individuals - Provide CCTV coverage of all exterior sides of the facility - Provide CCTV coverage of internal docks - Record CCTV images real-time - Retain CCTV recordings for a minimum of 30 days - Retain CCTV records in a secure storage area - Restrict access to CCTV system functions - Have a preventative maintenance plan in place for CCTV systems - Protect windows or other openings in warehouse walls and roof - Make sure that dock doors are of sufficient strength or design to prevent or delay forced entry by use of portable hand tools or ramming by vehicle - Make sure that exterior walls are designed to resist penetration by removing building fabric, cutting or ramming by vehicle - Provide a manned security monitoring post 24x7x365, secure from attack - Provide reinforced exit doors from warehouse (steel doors and frames or suitable alternative) - Protect ground floor warehouse windows by anti-ram

	<p>posts or other physical barriers</p> <ul style="list-style-type: none"> - Provide a restricted-access, caged/vault area for assets on site more than 2 hours (high-grade security mesh, chain-link, or hard wall, including top/roof, alarmed, CCTV, controlled access) - Use solid-top, hard-sided trailers with locked cargo doors or reinforced soft-sided trailers - Keep dock doors illuminated at night (externally) - Provide internal and external lighting levels that support high quality CCTV images and recording - Provide flood lighting of enclosed loading / unloading areas - Install GPS or similar technology on all vehicles transporting Buyer's assets
A number of implementation problems that were reported, relate to legal or privacy issues	<ul style="list-style-type: none"> - Verification of identity and authorisation of drivers and crew at inbound checkpoint: some drivers issue complaints about ID's being copied and filed with the shipping documentation - Criminal history checks / pre-employment checks: governments do not reveal enough information and business has no legal ground to check certain aspects such as criminal history or no access to data sources - Performing exit searches on exit from secure areas: these are not always permitted by law or by works' council - Scheduled routing or GPS monitoring: drivers sometimes feel reluctant and see it as 'an invasion on their freedom and privacy' and a 'limitation on their freedom of movement'.
A number of problems relates to practicability issues, esthetical impact, commitment and availability	<ul style="list-style-type: none"> - Building security: architects / developers of real estate do not always allow changes to the building plans. Often 'the looks' are considered most important by architects - Identification/ID badges are often considered as 'not popular' and it is very difficult to keep on convincing / reminding staff that they have to wear them - Enhanced lighting conditions often attract opposition from an environmental point of view (light and energy pollution)

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- GPS on all vehicles often depends on availability: during busy seasons / periods it is not always possible to use trucks with GPS or similar technology
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Finally, one respondent points to the risk for ‘escalation of violence’

- Overt or covert escorts will not prevent ‘die hard criminals’ from attacking a truck: “they will act with force when they think it is necessary”
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References

Haelterman, H. (2009) *Effectiveness and Potential Spill-over Effects of Counterterrorism Measures defined in International Supply Chain Security Programs*, Counteract Report FT4/A, EC Contract Number SSP4/2005/TREN/05/FP6/S07.48891, not published.

